

Mining Action Group

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Public Comments

Aquila Back Forty Wetlands Permit Application

MIWaters Submission Number: 2PG-QHZB-HA13
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[Red-Flag Permit Review by Dr. Kendra Zamzow, with additional LEDPA Review by Dr. David Chambers, CSP2](#)
[Hydrological Review by Dr. Tom Myers](#)

[Conclusions](#)

[Summary of Key Attachments](#)

REFERENCES

Our comments reference materials submitted by Aquila Resources in support of their Back Forty Wetlands Permit Application, as well as relevant files previously uploaded to the MiWaters database, information published on the applicant's website, media statements made by the applicant, and permits previously issued by the State of Michigan. The Wetland Permit Application files are the key resources:

Wetland Permit files (*direct links*)

§1-4: [1 R-Wetland Permit Application Nov 2017 reduced Sections 1-4 rev Dec 2017.pdf](#)
§5-7: [2 R-Wetland Permit Application Nov 2017 reduced Sections 5-7 rev Dec 2017.pdf](#)
§8A: [3 R-Wetland Permit Application Nov 2017 reduced Section 8A.pdf](#)
§8B: [4 R-Wetland Permit Application Nov 2017 reduced Section 8B.pdf](#)
§8C: [5 R-Wetland Permit Application Nov 2017 reduced Section 8C.pdf](#)
§ Appendix A1: [6 R-Wetland Permit Application Nov 2017 reduced App A1 rev Dec 2017.pdf](#)
§ Appendix A2: [7 R-Wetland Permit Application Nov 2017 reduced App A2 \(1\).pdf](#)
§ Appendix B: [8 R-Wetland Permit Application Nov 2017 reduced App B.pdf](#)

Michigan - MCL Part 303

<https://drive.google.com/file/d/1qAWJiRVAfDXqdxWlOmJYfeX46CdPtoDS/view?usp=sharing>

Michigan - State and Federal Regulations

http://www.michigan.gov/deq/0,4561,7-135-3313_3687-10801--,00.html

Michigan Wetlands - Permit Review Criteria

http://dmbinternet.state.mi.us/DMB/ORRDocs/AdminCode/978_2011-015EQ_AdminCode.pdf

Michigan DEQ Guidance Document – WRD Water Withdrawals 303

http://www.michigan.gov/documents/deq/wrd-policy-023-parts-301-303-water-withdrawals_440648_7.pdf

Michigan DEQ – “General Guidelines for Calculating a Water Budget” Water Resources Division (WRD)

http://www.michigan.gov/documents/deq/wrd-water-budget_565040_7.pdf

US Army Corps of Engineers - Regional Supplement - Wetland Delineation Manual: Midwest Region

http://www.usace.army.mil/Portals/2/docs/civilworks/regulatory/reg_supp/erdc-el-tr-10-16.pdf

EPA - Section 404 of the Clean Water Act - Determination of Mitigation

<https://www.epa.gov/cwa-404/memorandum-agreement>

EPA – Methods for Evaluating Wetland Condition, #20 Wetland Hydrology

https://www.epa.gov/sites/production/files/documents/wetlands_20hydrology.pdf

Living With Michigan Wetlands

https://www.watershedcouncil.org/uploads/7/2/5/1/7251350/living_with_mi_wetlands.pdf

Aquila Back Forty Mining Permit and Environmental Impact Assessment

While DEQ Wetlands staff have stated that “only” the Wetland Permit files can be discussed in this permit review, the Wetland Permit includes multiple cross-references and citations related to the Back Forty Mine Permit application, and the Wetland Permit builds upon the original Environmental Impact Assessments. Michigan DEQ archived the Aquila Back Forty Project's original application, including 6 permit application files and 10 Environmental Impact Assessment files (16 total); this directory also includes the DEQ's “Part 632 Request for Additional Info” file, and the final Mine Permit (issued on December 28, 2016).

[ftp://GeoWebFace:Geology\(1\)@ftp.deq.state.mi.us/geowebface/Mining/Back_Forty_project/](ftp://GeoWebFace:Geology(1)@ftp.deq.state.mi.us/geowebface/Mining/Back_Forty_project/)

Lake Township, Menominee County, Michigan: Shakey Lakes Integrated Management Plan

<http://www.dickinsoncd.org/uploads/9/4/7/3/94739884/shakeylakesmanagementplancompressed.pdf>

Introduction

Interest in Application

The Mining Action Group (MAG) of the Upper Peninsula Environmental Coalition (UPEC), previously known as Save the Wild U.P. (SWUP), is a volunteer, grassroots effort to defend the clean water and wild places of Michigan's Upper Peninsula from the dangers of sulfide mining. As environmental stakeholders, we participate in a broad, grassroots, citizen-led effort to raise awareness about the dangers of sulfide mining. We believe the proposed Back Forty Project threatens critical freshwater aquatic resources, including the Menominee River watershed, Shakey River, Shakey Lakes, and other surrounding lakes, rivers, streams, and wetland ecosystems.

The Upper Peninsula is witnessing a resurgence in mining and mineral exploration which threatens watersheds in the Lake Michigan and Lake Superior basins. This resurgence threatens the treaty protected natural and cultural resources of federally-recognized tribal nations: playing off the area's history of economic boom-and-bust cycles, mining companies arrive promising good jobs and pledging concern for the environment, ignoring the fact that mining and milling bring short-term profits at the expense of long-term environmental contamination. The Aquila Resources (applicant, Aquila) Back Forty sulfide mine proposal perfectly illustrates the long-term environmental hazards of mining.

Statement of Concern

On behalf of our supporters, we have fully participated in the Public Process, and have submitted extensive written comment during the permit review process. Working collaboratively with regional environmental allies and fishing organizations, we have secured independent, third party reviews of the

Aquila Back Forty Mine Permit and Wetland permit applications. If granted, we believe this permit would unlawfully authorize the destruction and impairment of wetlands for the benefit of an individual company, while degrading freshwater natural resources of the State of Michigan and Waters of the U.S., and undermining the Public Trust without public benefit. We stand with a broad coalition of fishing groups, local residents, tribal members and environmental groups, united in their concern about Michigan's wetlands and the health of the Menominee River.

There is widespread opposition to the Aquila Back Forty project. Downstream communities are concerned about potential impacts to drinking water and tourism, and have passed resolutions against the project. Marinette County in Wisconsin unanimously passed a resolution opposing the Back Forty; additional resolutions have been passed by the Menominee Indian Tribe of Wisconsin, the Oneida Nation, Keweenaw Bay Indian Community, Midwest Alliance of Sovereign Tribes, Amberg, Peshtigo, Porterfield, Sister Bay, Wagner, the City of Marinette, Door County, Oconto County, Outagamie County, Shawano County, Menominee County, and Brown County, which includes the city of Green Bay. After concerned citizens levied significant pressure on local officials, Menominee County became the first county in Michigan to pass a resolution opposed to the Back Forty mine.

The proposed Back Forty site is located on the bank of the Menominee River, the largest watershed in Michigan's wild Upper Peninsula. In addition to open pit mining, the applicant proposes that milling is proposed on-site, using cyanide and other dangerous chemicals along with mining waste storage. Some tailings waste will remain on-site in perpetuity. The open pit mine will be backfilled with waste rock and tailings, most of which is considered "reactive" material, capable of producing acid mine drainage (AMD) when exposed to air or water. AMD devastates watersheds. It is difficult and expensive to remediate, and may continue leaching from the tailings for hundreds or thousands of years. In light of the extreme risk posed by this sulfide mining project, the Menominee River was listed as one of "America's Most Endangered Rivers" (American Rivers, 2017).

Wetland Impacts Threaten Menominee River, Michigan, Great Lakes

Since European colonization began in the early 1800s, Michigan has lost approximately 4 million acres of wetlands. According to Barb Avers, a wetland specialist with the Michigan Department of Natural Resources (DNR), "more than 50 percent of Michigan's historic wetland base has been lost, and the rate of wetland loss in key waterfowl landscapes exceeds 90 percent."¹

According to a 2014 report by the DEQ, the state lost 41,000 acres of wetlands between 1978 and 2005, or more than 1,000 acres per year on average. Wetlands are important ecosystems that provide many benefits, including water filtration, erosion and flood control, and essential habitat for a diverse array of species. Any damage to wetlands along the Menominee River will degrade the Menominee River Watershed, with negative impacts on downstream communities and Lake Michigan.

¹ <http://www.michigan.gov/dnr/0,4570,7-153-10366-457822--RSS,00.html>

Aquila Back Forty - Wetland Permit Application

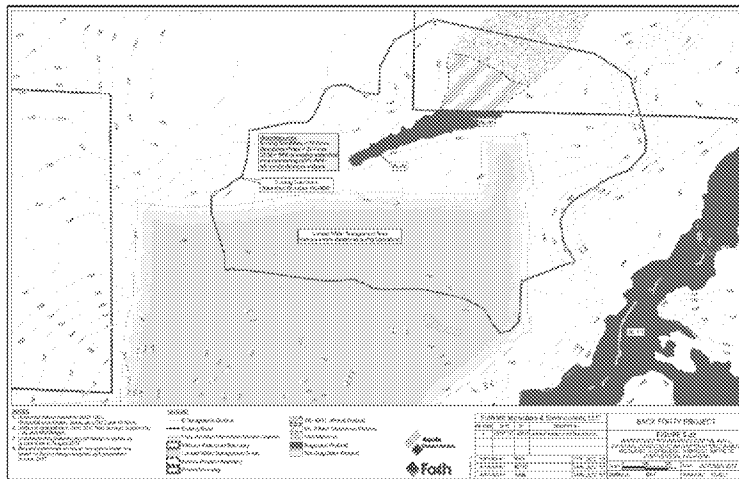
§3. Wetlands Impacts Summary

§3 is found in Volume I: [1 R-Wetland Permit Application Nov 2017 reduced Sections 1-4 rev Dec 2017.pdf](#)

Wetland Terminology is Misleading

In the permit application, Aquila uses the unusual and undefined phrase "upland wetlands". Aquila is apparently claiming that these "upland wetlands" are perched, or disconnected from groundwater, and that only "valley-bottom wetlands" are hydrologically connected to groundwater. To our knowledge, however, the phrase "upland wetlands" is not a recognized hydrological term. The phrases "upland wetlands" and "valley-bottom wetlands" refer to position and elevation, rather than the underlying hydrological connection. No mention of the terms "upland wetland" or "valley-bottom wetlands" is found in the USFWS National Wetland Inventory (NWI Wetlands and Deepwater Map Code Diagram²). Likewise, "upland wetland" is not a phrase defined by Michigan's Wetlands program, and is not found in program guidance or glossaries on the [EPA Wetlands site](#). The phrase "upland wetland" is used by researchers describing a few Australian or Ukrainian wetlands which are uncommon in the U.S. with the exception of wetlands in sand dune landscapes. In New South Wales (Australia), a site with natural depressions described as "Upland Wetlands" are actually sedge-dominated wetlands resting in basalt pockets, not forested wetlands. Geochemical research conducted in the arid McMurdo Dry Valleys of Antarctica references the "upland wetlands of Taylor Valley". These are glacier-fed wetlands without vegetation; the term "upland" may refer only to their elevation, not their hydrological connection with groundwater.

The applicant's use of the term "upland wetland" is misleading. In fact, "wetland" and "uplands" are widely understood in Wetland Delineation to be *opposites*, separated by the boundary between the two: upland (mesic to dry) versus wetland (wet, at least seasonally). For an example, refer to Volume I, §2, Permit Application: the boilerplate USACE forms for utility crossings instruct the applicant to identify "wetland/upland boundaries"; USACE identifies landscape features as upland OR wetland, not both.



Similarly, according to the Environmental Protection Agency (EPA), "40 CFR §22.24... The boundary of a wetland, therefore, should be drawn at the precise location at which the evidence supporting a wetland determination ceases to outweigh the evidence supporting an upland determination."³

The applicant appears primarily concerned with the elevation and topographic position of the wetlands, rather than their shared hydrogeology. While recharge and discharge are certainly affected by topography, the controlling influences would be the "wetland watershed boundary" (total

² "NWI Wetlands and Deepwater Map Code Diagram."

https://www.fws.gov/wetlands/documents/NWI_Wetlands_and_Deepwater_Map_Code_Diagram.pdf. Accessed 16 Jan. 2018.

³ Decisions of the United States Environmental Protection Agency, Volume 3. United States. Environmental Protection Agency November 1, 1989.

surface water input) combined with underlying soils and geology. Little consideration is given to the influence of hydric soils and sediments in determining hydrogeology. While recharge rate – percolation of water from wetlands to the underlying groundwater aquifer – may vary, depending on the permeability of the soils (permeable clays, silts, and peats) which generally underlie wetlands, the applicant's claim that "Upland Wetlands" are not connected with groundwater is unsubstantiated.

Wetland is Simultaneously "Upland" and "Valley Bottom"?

According to Volume I, "Table 3-2, Aquila Wetlands Determination of Potential Wetland Impacts - Operations Phase", the applicant claims that "WL-C1 Complex that includes WL-40/41 is a **valley-bottom wetland**, and "MODFLOW" fluxes were used. However, the "upland southwestern tip" of wetland WL-40/41 which lies within the project boundary was defined as an **upland wetland**, and the "Darcy Flux method was used to analyze this portion of the wetland separately." The impacts to a single wetland should be calculated using a single method. Calculations such as this one – using one method for the "tip" of a larger wetland complex – strains credibility. Wetlands cannot be simultaneously perched and tied to groundwater. The applicant should be asked to recalculate drawdown impacts, treating the entire wetland complex using the MODFLOW flux method. The applicant's desire to define wetlands by their topographic position is unsupported. Wetlands in the same complex are not simultaneously perched and tied to groundwater.

Wetland Quality Rating and Function Loss

Did the EIA survey specify wetland quality ratings (high v. moderate v. low) for wetlands located within the Back Forty project area that will be "indirectly impacted" by the project? In situations where wetlands provide critical habitat to listed species, are "indirect impacts" nevertheless "significant" impacts? If the life of mine is extended, how long can wetlands be "indirectly impacted" (dewatered) without suffering total ecosystem function loss, roughly equivalent to a "direct impact"?

Wetland Impacts on WL-40/41

It is concerning that an off-site wetland complex located on an adjacent property was identified in the permit application as "WL-40/41 Inferred Wetland" and the "Watershed Area Boundary" was drawn to include some privately-owned lands outside of the Project Boundary. To the best of our knowledge, this landowner did not give permission for wetland delineation work to take place on this property.

*Explain – how was the wetland inferred? Were delineations of this wetland complex, inferred wetland or the watershed boundary ground-truthed? Why are other off-site watershed boundaries or off-site "inferred wetlands" not included for similar complexes located on the south edge of the Back Forty site? How can the applicant include "Inferred Wetlands" which were not supported by field delineation? How are watershed recharge impacts on downgradient wetlands accurately estimated, when the off-site portions of the same wetland complex has not been field-delineated, and no soil borings or piezometers have been installed on private wetlands to support the applicant's conclusions? Given the "inferred" nature of these off-site wetlands, how does the applicant justify the wetland boundary, which includes land on the adjacent ownership for purposes of surface water inflow? If the watershed boundary is not extended onto property not owned by the applicant, what is the anticipated **total loss of surface water** to the system, and what is the resulting impact?*

According to the applicant, "with respect to obtaining authorization from property owners whose wetlands or streams that could be impacted by this project, the above-referenced "Potential Indirect Wetland Hydrology Impacts" report concludes that there will be no impacts to those off-site regulated resources." The application denies there will be any impacts to the adjacent private landowners, but independent hydrological review concludes that wetland impacts due to groundwater drawdown are underestimated. Wetland impacts meeting the drawdown threshold extend off-site (beyond the Boundary).

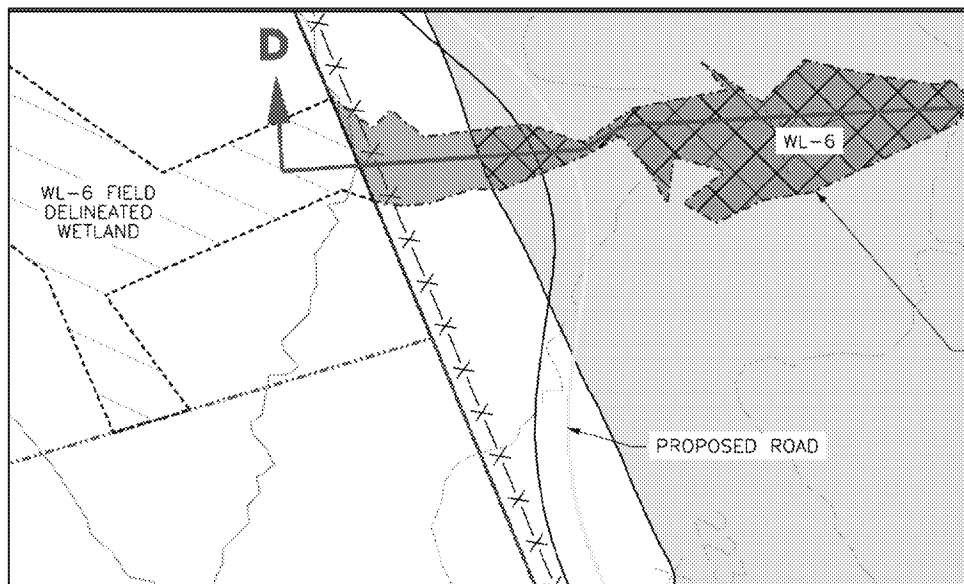
Wetland Impacts on WL-15B/WL-14

According to § 3, Table 3-1 "Wetland Impact Summary" the applicant claimed that the "Total Delineated Wetland Size (acres)" and "Wetland Size Within Project Boundary" (acres) for wetland WL-14 is "6.15 acres" with Direct Impacts (due to "Excavation") of 0.13 acres – plus "Proposed Wetland Indirect Impacts" of "6.15 acres. **Applicant concludes that the TOTAL Proposed Wetland Impacts will be 6.28 acres. Explain – how can the total impacts to WL-14 (6.28 acres) exceed the total delineated size of the wetland (6.15 acres)? Is this miscalculated?**

How can the applicant possibly claim that impacts to WL-15B/WL-14 have been appropriately calculated? First, the diagram clearly states "EXISTING RIVER ROAD TO BE CLOSED AND EXCAVATED" and shows that wetlands (WL-15B/WL-14) are currently bisected by the existing road. To our knowledge, based on conversations with Lake Township officials, no decision has been made that would allow the applicant to close River Road and excavate the roadbed to form the open pit mine. Likewise, nothing currently permits the construction of an additional mine waste storage facility, south of the open pit; this facility design revision would require a significant amendment to Aquila's Part 632 Mining Permit.

The decision – whether to abandon a critical county road – is not in the applicant's control. Where is the documentation supporting Aquila's assumption that the "EXISTING RIVER ROAD" will actually be closed? Has the Menominee County Road Commission made a final determination? Have alternative routes been reviewed for wetland impacts? We understand that they have not.

Wetland Impacts on WL-6



Screenshot showing detail of Wetland 6 (Vol. I, Figure 4-8, Cross Section D-D' WL-6).

Why does the diagram for Wetland 6 show a "proposed road"? Please clarify: is the "proposed road" an internal "site access road"? A dike, or a part of the (new) contact water basin? A proposed realignment for River Road? Other? Will the NPDES discharge pipeline be buried within this roadbed?

What are the dimensions of the proposed road (width, including ditches or shoulders). Why is the road not clearly identified on the other site plans and figures in §4? Is the arrow (pointing at the blue line) properly identifying the "proposed road" or a buried NPDES discharge pipeline? The same blue line is found in

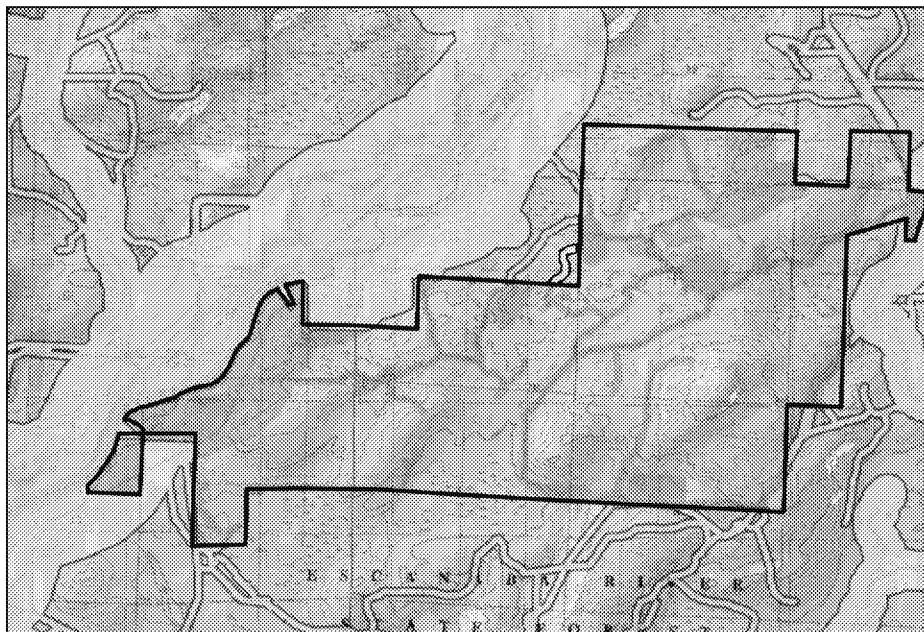
Figure 4-4, Wetland Cross Section Locations, where it appears to be identifying the NPDES discharge pipeline. Figure 4-4 includes the following statement: **“Proposed River Road Dead End and Connection to Site Access Road.”** Figure 4-4, however, shows no “proposed road” or “site access road”, only the NPDES pipeline.

Wetland Impacts Caused by River Road (Closure, Rerouting)

The River Road closure and rerouting/realignment issues have not been resolved, and the true wetland impacts remain uncalculated. Depending on the alignment – for example, if the road is extended eastward, along either the north or south boundaries of the Project Area – there would be SIGNIFICANT ADDITIONAL IMPACTS. This is not hypothetical, as an eastern route was previously discussed in the EIA, though poorly disclosed. The Back Forty site is bordered by large wetland complexes on the north and south. *Where is the most likely and foreseeable proposed reroute corridor, and what are the potential impacts to wetlands and cultural or archaeological resources? Unclear.*

One of the applicant's first ideas would have rerouted River Road into the extremely narrow zone left between the Menominee River and the cut-off wall of the open pit mine. This area is less than 150' wide, however, and any reroute of River Road closer to the river's edge would inevitably impact additional cultural resources: the River corridor as a whole was identified as an “Area of Increased Archaeological Sensitivity” in the EIA, with numerous cultural sites identified. The applicant claims the planned road realignment has been dropped, but the application contains conflicting information regarding River Road.

The survey noted: “Very little formal archaeological survey has been conducted in the Back Forty Archaeological Project Area, and **only limited survey has been conducted along the Menominee River near the Sensitivity Study Area.** Perhaps the most intensive survey conducted in Menominee County was Buckmaster's work in the 1970s (Buckmaster 1979). This survey was not a systematic effort; rather, it was a stratified survey focused on increased probability areas. Only a couple of compliance surveys have been conducted at the northern end of the Sensitivity Study Area on the Wisconsin side of



the river (Brazeau et al. 1990; Van Dyke 2006), but these have been limited in their scope within the study area. That these limited surveys identified sites 47Mt98 and 47Mt280 further demonstrates the sensitivity of the area. It should also be noted that the garden bed site (20ME61) was not identified during investigations in the area by Buckmaster and her crews in the 1970s (see also Franzen and Weston 1973) or by University of Michigan crews in the 1950s.

Thus, even though

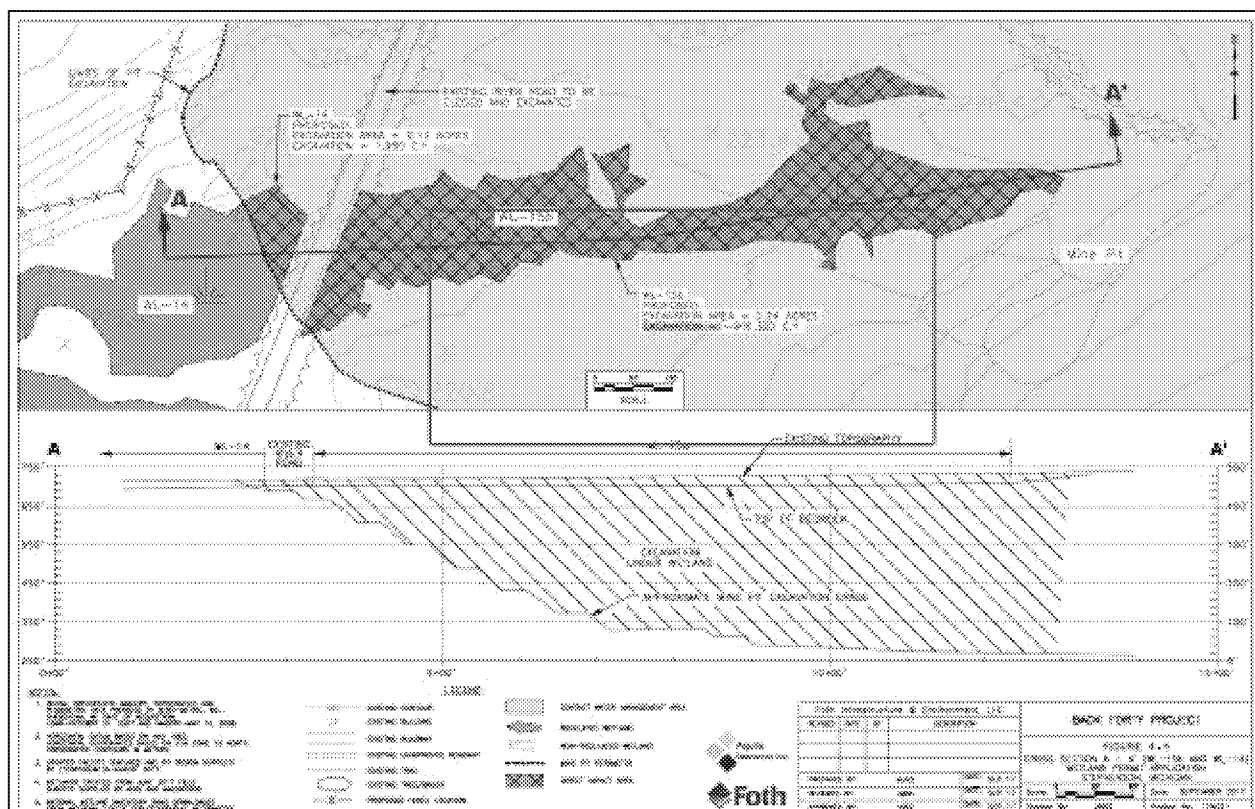
survey has been conducted in an area, this does not mean that all sites in the study area have been discovered.”⁴

⁴ Aquila Back Forty Mining Permit Application Environmental Impact Assessment Volume IIH

A wide area of Archaeological Sensitivity is runs along the Menominee River (yellow) and through the mine site (brown). **The mine site and open pit will destroy part of the sensitivity zone. The site should be thoroughly surveyed and all possible care should be taken to AVOID any additional impacts, rather than mitigate as cultural sites are disturbed.**

At present, River Road is considered a "Scenic Area" and part of the Escanaba Forest SCA. Since the applicant's activities would be the cause of the rerouted road, all wetland, cultural, scenic and aquatic impacts need to be calculated and attributed to the applicant – these impacts to wetlands are NOT attributable to the Menominee County Road Commission or some future contractor.

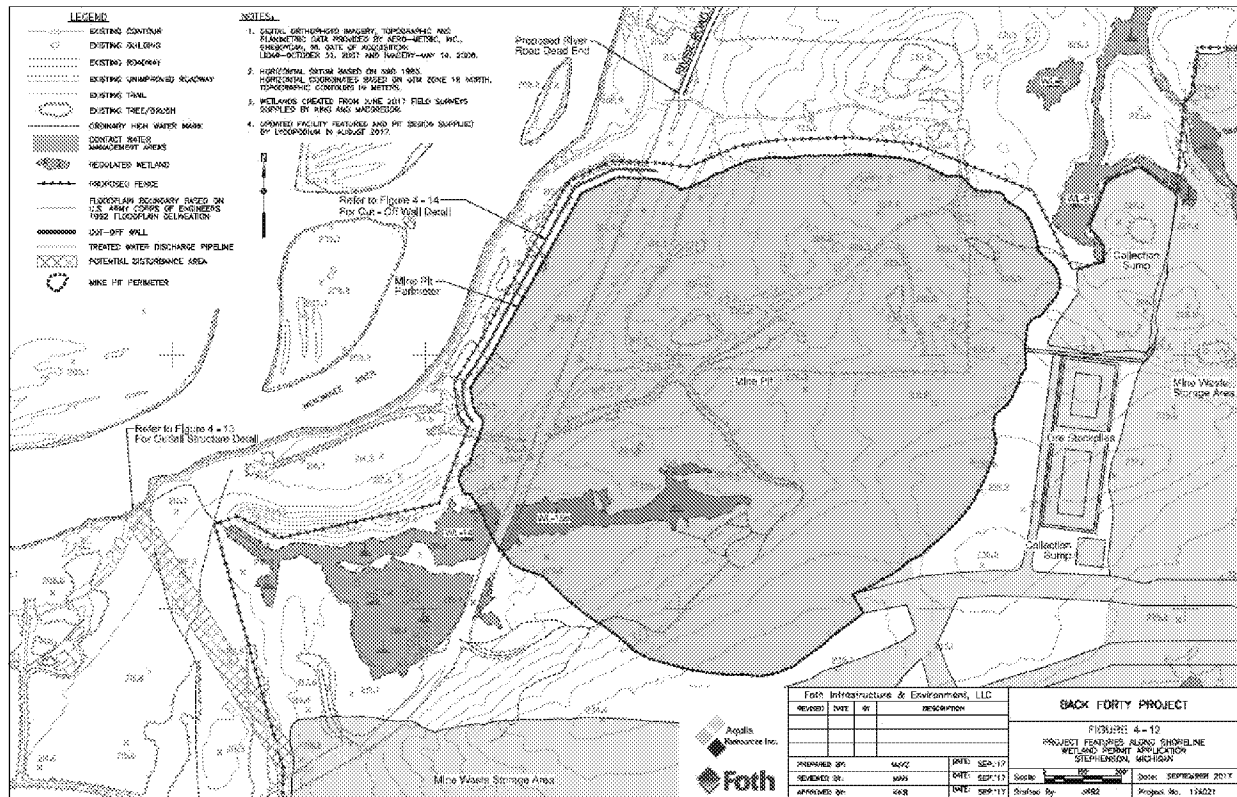
Part of the proposed "Excavation Area" along existing River Road appears in Figure 4-5 of Vol I, shown below. Yet no corresponding diagram is included for the excavation area for the section of road just south of this, that runs between the larger, lower lobe of WL-14 and WL-14a.



Screenshot of Vol I, Figure 4-5, showing proposed excavation area for Wetlands 14 and 15b. No corresponding diagram is provided for the section of **road** immediately south of this, which runs between the lower lobe of WL-14 and WL-14a.

Further concerns relate to Figure 4-12 (shown below), which shows an overview of the section of River Road that the company proposes to **excavate**. The excavated area runs between WL-14 and WL-14a. Figure 4-12 shows wetland 14a as partly within the excavation area, yet there is no corresponding map and diagram showing the area and volume proposed to be excavated from this wetland. No excavation volume is given for WL-14a in §3, Table 3-1. Table 3-1 lists indirect impacts to this 0.16 acre wetland as 0.03 acres, but lists no direct impacts.

This appears to be a serious omission. *How many cubic yards of material does the company plan on excavating from WL-14a?* Any removal of material obviously constitutes a direct impact to this wetland. Furthermore, the hydrology of the rest of WL-14a will undoubtedly be affected – drained by the adjacent pit mine. WL-14a impacts will functionally and practically dewater and destroy the wetland. The claim of partial “indirect impacts” relies on misleading assumptions. The applicant is trying to claim that the site is disconnected from groundwater, which we dispute.



Enclosure: Detailed EPA comments on the Michigan Wetlands and Inland Lakes and Streams Permit Application for the Back Forty Project

Application Completeness

The project plan views indicate that the proposed facility layout is subject to change. A final site plan is needed to demonstrate the significance of the impacts and the least environmentally damaging practicable alternative. To fully evaluate all potential aquatic resource impacts, the applicant should include the maximum foreseeable impacts.

The project plan would result in Shore Road terminating within the project area. There will likely be a need to re-route Shore Road. Because this reroute would be required because of the proposed project, the impacts, alternatives, and mitigation analysis should include any aquatic resource impacts from the construction of a bypass road around the mine. If there is any other infrastructure (power lines, access roads, etc.) needed to facilitate the project, the associated aquatic resources impacts must also be included in the application.

River Road - Significant Impacts (Unresolved)

EPA stated in their previous objections: "The project plan would result in Shore Road (sic) terminating within the project area. There will likely be a need to reroute Shore Road. Because this reroute would be required because of the proposed project, the impacts, alternatives, and mitigation analysis should include any aquatic resource impacts from the construction of a bypass road around the mine. If there is any other infrastructure (power lines, access roads, etc.) needed to facilitate the project, the associated aquatic resources impacts must also be included in the application."

In this Permit application, Aquila states: "Menominee County Road Commission was notified of this pending Application and **the intent of Aquila to remove a portion of the existing River Road from the project area. In the interest of avoiding additional wetland impacts, we have also eliminated the originally-proposed road bypass for River Road (as previously proposed in the January submittal of this Permit Application).**"

While this is clearly in the interest of the applicant, it defies logic: "in the interest of avoiding additional wetland impacts" – there will be NO solution? The applicant still intends "to remove a portion of the existing road" (excavate the roadway to create an open pit mine). The applicant is now attempting to externalize the costs of their proposed project (closure of Menominee County's River Road, which will require some sort of bypass route, yet to be determined). The applicant is attempting to move their problem to the local county government (residents of Lake Township, Menominee County Road Commission), rather than solving the problem and incurring the cost themselves (direct and indirect impacts to wetlands and aquatic resources). **River Road will serve as a haul road and local access road; the issue is complicated by the fact that it must be terminated to develop the open pit.**

Aquila clearly still assumes that River Road will be "CLOSED AND EXCAVATED", but the Wetland Permit includes no environmental assessment for a bypass route. The costs to wetlands and the significant burden of a rerouted road— negative externalities – are shifted to local residents. While the utility corridor has now been identified, it remains unclear what route River Road would take. Engineering plans were previously developed, showing a potential route between the pit and river (west side), but the applicant has apparently abandoned that idea.

No engineering plans are provided in the Wetland Permit. Connecting the existing River Road (southwest corner of site) with the utility corridor (east side of site) could not be done without extensive wetland losses. **These fundamental questions have not been answered by the applicant.**

The EPA's 2016 objections, cited above, appear unresolved. The applicant has attempted to dodge this problem "in the interest of avoiding additional wetland impacts".⁶ All negative impacts to wetlands and cultural resources are directly attributable to their proposed action, however. A solution is required, along with a responsible accounting of the direct and indirect impacts to wetlands, aquatic resources, scenic resources, and archaeological zones along the River. It is facetious for the applicant to suggest that the reroute issue, created by their own action, will be solved by eliminating a solution (the "originally-proposed road bypass"). Nothing has been resolved, only dodged.

Wetland Impacts on WL-14/14a/15b and WL-B1/B3/B1c/52/B2

Applicant has identified these wetland complexes (WL-14/14a/15b) as "Upland Wetlands." We disagree on the term, and find problems with applicant's methods and conclusions. The hydrological connection should be assumed, given inconsistencies in groundwater modeling. The WL-14/14A/14B complex will likely be entirely destroyed by direct and indirect impacts. Refer to our detailed comments on "Upland Wetlands and the "Darcy Method"; lack of soil borings to depth, scarcity of soil boring sites, lack of physical evidence for "perched wetlands" or confining layer, etc.

Applicant Claims NO Wetland Impacts Extend Off-Site

The applicant provides no relevant evidence to back up its claim that NO Indirect Impacts will extend off-site; its claims to this effect contradict hydrology, Aquila's original Groundwater Modeling, and relevant fact-based research. Many of the parameters used in the hydrology data were collected off-site or were estimates and assumptions, not supported by local, relevant or adequate data.

The groundwater model requires local data in order to accurately predict impacts to wetlands: precipitation, evapotranspiration, run-off *from* uplands, run-on *to* wetlands, vertical hydraulic conductivity, and stream flow. None of this data was collected on site.

According to an independent review of the permit by hydrologist Tom Myers, "The application acknowledges direct impacts to 11.22 acres and indirect impacts to 17.17 acres of wetlands. The review presented in this memorandum shows that indirect impacts will occur to far more than 17.17 acres because the modeling underestimates the extent of the groundwater drawdown. The Back Forty mine will have much greater indirect impact on wetlands than acknowledged in the permit application."⁷

Wetland Impact Claims Based On Outdated Precipitation Data

Applicant states: "Frozen soil conditions during the winter months and snowmelt in the spring were accounted for in the model. Precipitation was summed between December 1 and March 31, and applied equally over the 30 days in month of April." This modeling assumption fails to consider a March thaw event – which has happened in recent years – during which a significant amount of snow might melt and run off before the (still frozen) ground can absorb the water. **By applying four months of summed (December 1 - March 31) winter precipitation evenly over the whole month of April, the applicant may have been, effectively, adding (precipitation) water into the groundwater system where it never actually entered.** Besides, the spring thaw never occurs evenly - there are relatively warm, sometimes rainy days where snow melt is quite rapid, and cold days where there is little or no significant snow melt, and late winter storms which sometimes result in large snowfalls which melt over a few days. It is misleading to sum four months of precipitation ("winter") and enter it into the model over 30 days ("applied equally") due to numerous unconsidered variables including sheeting and flash run-off, concretized soil conditions due to refreeze and frost reductions in absorption and permeability, undetermined hydrology (such as channelized flow), and limited wetland holding capacities. According to the Michigan DEQ, "Soils thaw from the top down and if frost is in the ground this results in increased

⁶ Aquila letter to Kristina Wilson, DEQ, October 2, 2017, Vol. I page 7.

⁷ Back Forty Wetland Permit - Technical Memorandum by Dr. Tom Myers, <http://bit.ly/Back40TMyers>

runoff quantities from saturated surface soils because infiltration cannot occur.”⁸ Similarly, “Soil texture and aspect play an important role in the development of concrete frost. South facing slopes with open canopies (e.g., jack pine forest) undergo periodic melting and refreezing throughout most winters, facilitating formation of concrete frost.”⁹

Applicant repeatedly claims in “Table 3-2 Aquila Wetlands Determination of Potential Wetland Impacts - Operations Phase” that Menominee County receives “31.07 in/yr” and asserts that “Wetland is saturated during the spring growing season.” This statement ignores regional climate information. According to a Menominee County report from Great Lakes Integrated Sciences and Assessments (GLISA), “Annually, precipitation has decreased in the climate division that includes Menominee County. This decrease has not been evenly distributed throughout the year. Seasonally, precipitation has increased during the fall. Summer and spring have seen decreases in precipitation, while winter precipitation amounts have remained constant, in terms of the amount falling as rain or liquid water contained in snow.”¹⁰ In the Short Term 2021-2050 (ie: during the Life of the Mine), Menominee County is projected to **lose precipitation during spring and summer**. *How will the loss of precipitation change the applicant's assertion that wetlands will be “saturated during the spring growing season” – regardless of groundwater drawdown? For example, the Midwest precipitation ranges forecast decrease of as much as 4% in the short term.*

An independent analysis of the hydrological modelling process and the parameters used in those models finds that the impacts to wetlands from drawdown will be much greater than currently acknowledged. See the hydrological review: Back Forty Wetland Permit - Technical Memorandum by Dr. Tom Myers.

Unwarranted Use of “Darcy Method” for Wetland Predictions

The applicant used the “Darcy Method” – a fundamental principle underlying the study of water flow in porous media – to help determine wetland type, and wetland impacts. *Explain why the Darcy Method was selected for the use in determining **certain** wetland sites, while other wetland determinations incorporated the MODFLOW groundwater model?*

“Darcy's Law that was derived originally empirically 160 years ago, has been used successfully in calculating the (Darcy) flux in porous media throughout the world. However, field and laboratory experiments have demonstrated that the Darcy flux employed in the convective disperse equation could only successfully predict solute transport under two conditions: (1) uniformly or densely packed porous media; and (2) field soils under relatively dry condition. Employing the Darcy flux for solute transport in porous media with preferential flow pathways was problematic. (...) Darcy's Law inherently merges momentum and in that way erases information on pore-scale velocities. For that reason the Darcy flux cannot predict flow in media with preferential flow conduits.”¹¹

Far from being either “uniformly or densely packed” or “field soils under relatively dry condition”, the applicant's Soil Boring logs identified ALL of the wetlands as “wet” (water-saturated soils) from wetland surface to the bottom of the boreholes; no boring sample or other physical evidence about whether there is “uniformly” or “densely packed porous” soil is provided for the zone between the bottom of wetlands (where auger was refused and the applicant claims an aquitard exists), and the underlying groundwater.

⁸ https://www.michigan.gov/documents/deq/wrd-cswo-sesc-manual-unit1_556402_7.pdf

⁹ “Formation and maintenance of permanent perched wetlands in ... - ERA.”

https://era.library.ualberta.ca/files/cf1881m20z/James_Lindsay_M_201703_MSc.pdf. Accessed 30 Jan. 2018.

¹⁰ “LOCALIZED CLIMATE INFORMATION.”

[http://www.menomineeecd.com/uploads/2/3/0/9/23095382/menominee_climate_summary_\(small\).pdf](http://www.menomineeecd.com/uploads/2/3/0/9/23095382/menominee_climate_summary_(small).pdf). Accessed 14 Jan. 2018.

¹¹ Steenhuis, Tammo, K.-J. Sam Kung, Dan Jaynes, Charles S. Helling, Tim Gish, and Eileen Klavivko. 2016. “A Review of Darcy's Law: Limitations and Alternatives for Predicting Solute Transport”. See <http://adsabs.harvard.edu/abs/2016EGUGA..18.9238S> (January 27, 2018)

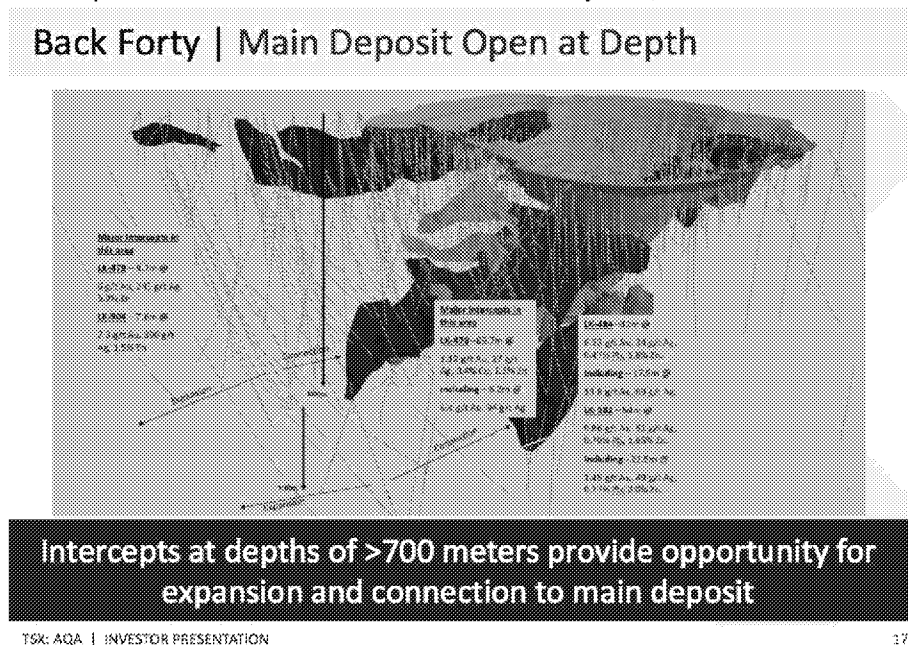
Given the presence of **fully saturated soils** in these Back Forty “upland” wetlands, the Darcy method cannot be successfully used for their hydrological prediction. Darcy’s Method is credible with laboratory constraints, such as *uniform porosity*; Darcy’s Law is based upon experiments in a column of sand. When the Darcy method is applied to situations of flow in fractured rocks or in “fine-grained materials of low permeability”, the range of validity is exceeded. “The physical processes and forces governing saturated and unsaturated flow are substantially different: elastic-mechanical forces as opposed to surface tension and capillary forces.”¹²

The permit does not include soil samples at depth, hydrogeological cross sections or Fence Diagrams in support of the applicant’s conclusion. Given the lack of supporting physical evidence (scattered, shallow soil borings, only 1-3 per wetland), the applicant’s Darcy Method calculations are not supported by fact and should be seen as speculations. Mathematical modeling conclusions need to be buttressed by physical samples. The application should have included comprehensive hydrogeological data, including soil borings which clearly intersect the theoretical “confining layer” from multiple locations in each wetland. Given the apparent mismatch between groundwater modeling and groundwater elevations from actual measures, additional evidence is needed to support the applicant’s claims of “confining layers” and perched wetlands or “Upland Wetlands”.

Potential Indirect Impacts Extend Off-Site

The applicant claims there will be **NO “potential indirect impacts extending off-site.”** This outrageous claim hinges upon annual precipitation figures, wetland water sampling (largely completed in several months of 2017), and an assumption that some of the wetlands are held by a “confining layer” that would serve as a barrier to groundwater drawdown.

Additionally, the drawdown modeling uses the assumption of a 7 year “Life of Mine” and concludes, without adequate evidence, that groundwater drawdown will not impact wetlands beyond Michigan’s 6” threshold for impacts. The actual “Life of Mine” will be 16 years, at a minimum:



¹² Narasimham, T. N. 2004. “Darcy’s Law and Unsaturated Flow.” See <https://pubs.geoscienceworld.org/vzj/article-abstract/3/4/1059/111752/darcy-s-law-and-unsaturated-flow?redirectedFrom=fulltext> (January 27, 2018).

Groundwater dewatering will take place for 16 years, at a minimum. The company is planning an extensive underground mining phase which will dramatically increase the impacts. Open pit mining is called "Phase 1" in all of the company's investor materials. "Phase 2" will require keeping the pit (as an access ramp) plus new tunneling, at least doubling the mine life and impacts. The plan for underground mining is "reasonable and foreseeable" as it has been repeatedly illustrated by the applicant¹³ although the applicant also denied that underground mining was feasible in their Part 632 Mining Permit application. Depictions such as the slide (above) illustrate multiple lobes of the orebody extending underground, away from the pit, and operational costs and yearly metal production estimates have been prepared for investors, clearly showing extraction through Year 16.

Significant Impacts Due to Dewatering and Groundwater Drawdown

The applicant identifies some of the wetlands at the site as "Upland Wetlands using Darcy Method." The applicant suggests these wetlands are "perched"¹⁴ and isolated from the influence of groundwater. Through this classification, we believe the applicant is attempting to artificially limit total "indirect impacts" to wetlands, since groundwater drawdown would otherwise result in significant losses to these "Upland Wetlands" (complexes WL-14/14a/15b and WL-B1/B3/B1c/52/B2). The applicant does not provide physical evidence such as a grid of soil borings to groundwater depth, illustrating a consistent confining layer. The conclusion that upland sites are perched wetlands is inferred or intentionally misleading.

§5. Wetland Delineation and Stream Evaluation

§5 is found in Volume II: [2 R-Wetland Permit Application Nov 2017 reduced Sections 5-7 rev Dec 2017.pdf](#)

MiRAM

MiRAM forms included in Volume V, §8C of the permit application were (*partially*) completed for the wetlands on the proposed mine site and for possible wetland mitigation sites. The first page of the MiRAM rating form states: *"The MiRAM was designed to be used during times when adequate plant growth allows for proper identification of most plant species within the Wetland. Typically, this follows the growing season for a particular region. MiRAM evaluations conducted outside the growing season will receive an additional 10 points due to the inability to properly identify all wetland features during this time of year. MiRAM is not designed to be used in times of snow cover."*

MiRAM forms for the proposed mine site that include dates indicate that most of these wetlands were surveyed from May 1-4, 2017. At that time of year, portions of the U.P. landscape still contain melting snow, and snow remains possible. *Most herbaceous plants, including rare plants, would still be dormant or just emerging from the ground, and unidentifiable or easily overlooked. This is clearly evident from the photos of these wetlands, included in §2 of the permit application. The unrealistically short plant lists in these forms are no doubt due at least in part to the fact that it was phenologically too early to do complete and accurate surveys. Conducting the MiRAM surveys of the wetlands on the proposed mine site this early would have resulted in many missed species and artificially lowered ratings for these wetlands, even with the 10-point compensation added in.*

Significantly, the MiRAM forms for the proposed mine site are not completely filled out: this includes omitted check-boxes for the questions on the first page of the form, which ask for wetland size, a locations map of the wetland, photographs of wetland vegetation and other features, and a landscape sketch or aerial photograph showing the proposed project site and wetland evaluation area, with the MiRAM boundary and other wetland features clearly marked. The MiRAM evaluations were poorly prepared. Additional problems were noted:

¹³

¹⁴ "Perched wetland - Biology-Online Dictionary." http://www.biology-online.org/dictionary/Perched_wetland. Accessed 7 Jan. 2018.

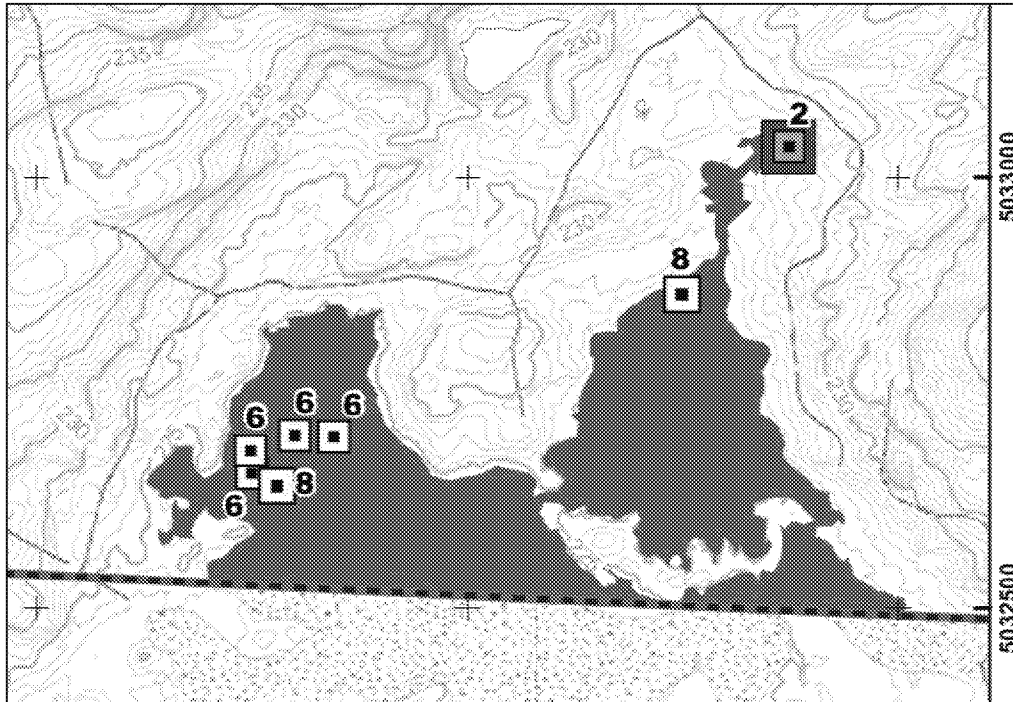
- Boxes under “Checklist of features and conditions to observe during the field inspection” were ignored.
- Box indicating whether or not an “approved” threatened and endangered species survey has been completed is checked “No” on all of these forms – despite the fact that area-wide rare species surveys were supposedly done in 2015, as part of the Environmental Impact Assessment of the site. *Clarify: are the area-wide surveys of 2015 considered “approved threatened and endangered species surveys”?*
- **Worse, the MiRAM forms do not indicate which wetland they apply to.** Instead of “WL-14” or similarly clear, each wetland is identified as “Back Forty Mine” with T/R and Section #s. This data cannot be readily referenced to maps of the site, or diagrams showing each wetland.

On page 25 of Appendix A-1 (see Vol VI) the applicant states that the MiRAM ranking system “provides a set of narrative and quantitative rating metrics to evaluate wetland value and function”, including “Rare species and habitats.” **Yet in every case they acknowledge on the MiRAM form that no approved T/E survey been completed for the wetland.** *How can the wetland be assessed for “rare species and habitats” if no approved T/E survey was done?*

Just below that, each form asks whether DNRE’s (now DNR) “Endangered Species Assessment (ESA) website interactive map” indicates a “potential for unique natural features at or near your site of interest?” Although this website is defunct, the surveyors presumably were aware that the MNFI now contains that information, not to mention Aquila’s own 2015 EIA for this project. **The surveyors habitually responded “No” to the “Rare species and habitats” question, on all forms, despite the fact that one facultative wetland (FACW) plant (Vasey’s rush, *Juncus vaseyi*), State-Threatened, is documented from the mine site.¹⁵ Vasey’s rush is found in wet and seasonally wet prairie and savanna-related ecosystems in Shakey Lakes savanna¹⁶ It has a FQI coefficient of 10 (on a scale of 1 to 10), which means that it has a strong affinity to these natural, unaltered communities. The rare plant surveys done for the 2015 EIA revealed a population of Vasey’s rush (“2”) at the northern tip of wetland A-1 (see Figure 3-34 of the first volume of the EIA). Other populations of Vasey’s rush are known from wetlands of the Shakey Lakes savanna. Therefore according to the MiRAM Rapid Assessment Method the surveyors should have checked the boxes for 2d and 2e of the Narrative Rating section as “Yes”, the box for “Rare Natural Community Type” should have been checked “yes”, and the wetland should have been ranked as having “high functional value.” This should have been done at a minimum for all the wetlands on the proposed mine site that were not forested. The wetlands at the mine site should be understood as part of the unique ecological landscape of the larger Shake Lakes savanna ERA, rather than as isolated wetlands identically named “Back Forty Mine.”**

¹⁵“Rapid Wetland Assessment For Michigan Section 1: Biological Framework”, Appendix X-B. Rare Plants Occupying Michigan’s Wetland Plant Communities, page 126. MNFI report, 2008.

¹⁶ Albert, D.A. 1990. Evaluation of the Shakey Lakes Barrens, Menominee County, Michigan as a potential National Natural Landmark. Report to the U.S. Department of the Interior, National Park Service, Division of Natural Landmarks. Report 1990-02. 59 pages.



According to Part 303, Wetlands Protection, of the Natural Resources and Environmental Protection Act,, "If the wetland is categorized as rare or endangered statewide, the ratio increases to five or more acres of created wetland for every acre of restored wetland... **Wetlands with endangered species are automatically defined on the MiRAM forms as having exceptional ecological value and are automatically rated as having high functional value.** "It should be noted that wetlands containing rare or endangered species are not permitted to be destroyed."¹⁷

MiRAM Qualitative Ratings of "Metric 7: Scenic, Recreational, and Cultural Value"

What was the average wetland score for Metric 7? What criteria were used? What are examples of "scenic" or "cultural values" used in rating these wetlands? Were indigenous "cultural values" given due consideration in the rating process? Unclear - what guidance does the State offer those who are ranking wetlands based on "cultural value"?

Impacts to Critical Habitat: Proximity to Shakey Lakes Natural Area

Shakey Lakes is the highest-quality occurrence of oak barrens in Michigan and one of the largest, least degraded barrens remaining in the upper Midwest. This conclusion is based on a comprehensive review of Midwestern Oak Savanna¹⁸ and on data of the Midwest Office of The Nature Conservancy. Adjacent state lands were recommended by former MNFI Lead Ecologist Dennis Albert for National Natural Landmark status¹⁹. Albert concluded (p. 47) that Shakey Lakes barrens were "nationally significant". Development of a sulfide mine immediately adjacent to this unique, high-quality savanna and the destruction of adjacent habitat will obviously degrade this area forever.

¹⁷ <https://ageconsearch.umn.edu/bitstream/11026/1/pb03st01.pdf>

¹⁸ Nuzzo, V. A. 1986. Extent and status of Midwest oak savanna: presettlement and 1985. *Natural Areas Journal* 6 (2): 6-36.

¹⁹ Albert, D.A. 1990. Evaluation of the Shakey Lakes Barrens, Menominee County, Michigan as a potential National Natural Landmark. Report to the U.S. Department of the Interior, National Park Service, Division of Natural Landmarks. Report 1990-02. 59 pages.

Dennis Albert further states: "Based on intensive field surveys that botanists and ecologists, including myself, conducted during the 1980s, I consider this site an extremely important site of high enough ecological significance that I recommended it for National Natural Landscape consideration in 1990, along with a second USFS managed site at Point aux Chenes. **These sites are recognized both for their ecological and cultural significance; both are recognized for their cultural importance by local Native American tribes and the original government survey notes from the mid 1800s document native presence, management, and/or occupation of portions of these sites.**" ²⁰

The Shakey Lakes Natural Area (savanna) is an ecologically unique and valuable place. It is classified as Oak-Pine Barrens community by the Michigan Natural Features Inventory (MNFI). With an "S2" ranking, this natural community is considered "imperiled" in Michigan due to restricted range, very few occurrences, and other factors making it vulnerable to extirpation in the state²¹. The Shakey Lakes savanna has also been considered an oak barrens community²², an S1 community that is "critically imperiled in the state" because of its extreme rarity or risk of extirpation.

In the mid-1980s research scientist Victoria Nuzzo looked into what was left of oak savanna habitat in the upper midwest. She found that of the approximately 27 to 32 million acres of oak savanna in the upper midwest at the time of European settlement, only about 2600 acres (0.02%) were left.²³ In other words, of every 10,000 acres of oak savanna that were here at European settlement, only 2 acres are left.

Dennis Albert's 1990 report to the National Park Service recommended that two parcels of state land, including the one adjacent to the south side of the proposed mine site, be designated a "National Natural Landmark." He recommended that this land remain in state ownership, and managed for the restoration and maintenance of natural ecological processes and values.

This site also holds the clear remnants of extensive garden beds, artifacts, and burial mounds of an ancient agricultural culture that were ancestors of the Menominee people of today.²⁴ How can an open-pit mine be allowed on the banks of the Menominee River, and tailings of high-sulfide ore left in perpetuity, without degrading or destroying the historical and cultural significance of this area, and its unique ecological features?

Proximity to SCA, ERA, and>NNL

The applicant greatly downplays the ecological importance of the Back Forty site, which is adjacent to an **Ecological Reference Area** shown in red in this "Dedicated & Proposed Special Conservation Area Map" ²⁵ (below). Note that *underneath the entire red shape is a yellow shape*, indicating that the adjacent ERA is also designated a "Non-Dedicated National Natural Landmark" site. *What effect will pit drawdown and other mining activities have on this wetland? How will altered water ground and surface levels affect the biological integrity of this wetland, and the integrity of the Shakey Lakes ERA?*

²⁰ Statement provided to Save the Wild U.P. by Dennis Albert, January 2016.

²¹ Cohen, J. G., M. A. Kost, B. F. Slaughter, and D. A. Albert. 2015. A field guide to the natural communities of Michigan. Michigan State University Press, East Lansing, MI. 362 pages.

²² Albert, Dennis. 1990. Evaluation of the Shakey Lakes Barrens, Menominee County, Michigan, as a potential National Natural Landmark. Michigan Natural Features Inventory, Lansing, Michigan. 60 pages.

²³ Nuzzo, V. A. 1986. Extent and status of midwest oak savanna: presettlement and 1985. *Natural Areas Journal* 6 (2): 6-36.

²⁴ Buckmaster, M. M. 2004. The northern limits of ridge field agriculture: an example from Menominee County. Chapter 3, pages 30-42 in: *An upper Great Lakes archaeological odyssey: essays in honor of Charles E. Cleland*. W. A. Lovis, ed. Cranbrook Institute of Science, Bloomfield Hills, MI.

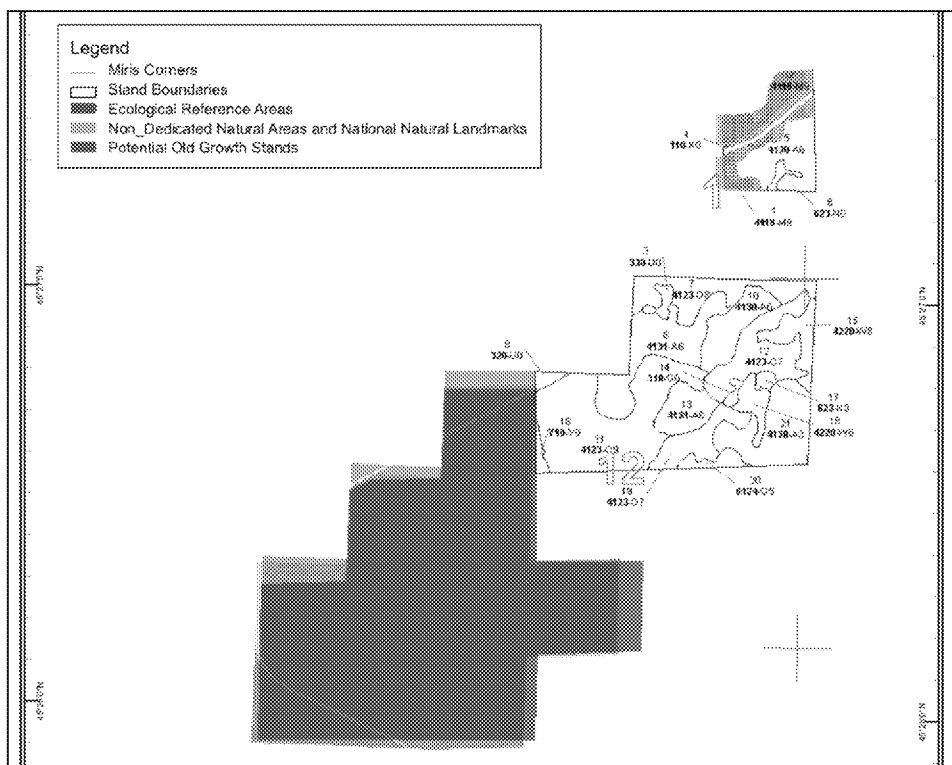
²⁵ "Escanaba Forest Management Unit Compartment Review"

http://www.midnr.com/Publications/pdfs/ForestsLandWater/Cmpt_Reviews/Escanaba/2012/esc023_comp_info.pdf Accessed 30 Jan. 2018.

The Shakey Lakes ERA oak-pine savanna, nominated for National Natural Landmark status, is located adjacent to the mine site, on the southwest.²⁶ The proposed mine site and the Shakey Lakes ERA appear to share a common wetland complex, which runs from state land within the project boundary (T35N R29W SE NW Section 12) west into state SCA land (SW NW Section 12). Even though this is an unregulated wetland, the western end *is* part of the (increasingly at-risk) SCA, and impacts to this wetland should be fully evaluated, especially in light of the concerns about underestimated dewatering (cone of compression), and the proximity to the mine pit. Artificial constraints in the modeling (River boundary) may have underestimated the extent of drawdown in this sensitive location.

The Michigan Natural Features Inventory GIS layer indicates that “no known element occurrences are within this compartment. However, potential habitat exists along the Menominee River riparian corridor. Many plant species unique to the Upper Peninsula can be found in southern and western Menominee County. The Shakey Lakes Oak-Pine Barrens Ecological Reference Area (ERA) and proposed Biodiversity Stewardship Area (BSA) are adjacent to this compartment.”²⁷

The ERA area and the mine site have been *further connected* due to Aquila’s 2017 acquisition of additional land between the Project Area, and the ERA. A field delineated wetland review is identified as “WL-6”. Despite the proximity to the Shakey Lakes Oak-Pine Barrens Ecological Reference Area, it is not clear whether the biological surveys for threatened and endangered species as conducted on this land.



²⁶ http://www.michigan.gov/deq/0,4561,7-135-3313_3687-100355--,00.html

²⁷ "Escanaba Forest Management Unit Compartment Review"

http://www.midnr.com/Publications/pdfs/ForestsLandWater/Cmpt_Reviews/Escanaba/2012/esc023_comp_info.pdf. Accessed 30 Jan. 2018.

The Compartment Review for this site also notes the importance of the river zone, describing the proposed Special Conservation Area (SCA) “unique site” called “SCA River Road Scenic Corridor” with the instructions: **“manage for archaeological interests, manage for late successional mesic northern forest, manage for old growth forest, manage for scenic highway corridor along River Road.”**²⁸

The Wetland Permit failed to acknowledge the presence of these Special Conservation Areas, or how the proposal threatens natural resources in these State managed areas.

Escanaba Mgt. Unit

Compartment: 023

Year of Entry: 2012

7 – PROPOSED SPECIAL CONSERVATION AREA* (SCA) DETAILS

* This is a partial list of SCAs for this compartment. Not included are those areas identified under other Department initiatives (Natural Rivers, Deer Wintering Areas, etc.). Those will be identified in separate, future map and report products.

Data updated before 10:00 AM

Stand	SCA Type	SCA Name	Acres	Comments
1	Unique Site - SCA	33023001	8.0	SCA--River Road scenic corridor. Manage for archeological interests, manage for late successional mesic northern forest, manage for old growth forest, manage for scenic highway corridor along River Road.
2	Unique Site - SCA	33023002	13.6	SCA-Menominee River riparian corridor. Manage for late successional mesic northern forest, manage for old growth forest, manage for scenic highway corridor along River Road. Stand contains Sixty Islands boat access site.

A second “unique site” is described as the **“SCA Menominee River riparian corridor. Manage for late successional mesic northern forest, manage for old growth forest, manage for scenic highway corridor along River Road. Stand contains Sixty Islands boat access site.”**

Doesn't the applicant's plan to close and excavate River Road contradict the State of Michigan's existing management plan? Aren't wetland losses and cumulative impacts on cultural and aquatic resources in the “River Road Scenic Corridor” area fundamentally incompatible with Michigan's conservation goals, given the presence of a listed species, an Ecological Reference Area, a nominated National Natural Landmark, and two Special Conservation Areas?

²⁸ *ibid.*

§6 is found in Volume II: 2 R-Wetland Permit Application Nov 2017 reduced Sections 5-7 rev Dec 2017.pdf

Table 4-1
Comparison of Alternatives Considered for the Back Forty Project

[illegible]

Seppälä et al., 2011
Lundholm et al., 2011

1000

[11] Robust linear solvers are released under a single, non-licenced, public domain copyright license in 0.01 \$/4. Figure 4.3

© 2004 Blackwell Publishing Ltd, *Journal of Internal Medicine* 255: 103–110

[illegible][illegible]

2000年12月29日

_____ *Trachurus trachurus* (Linnaeus, 1758)

According to the review conducted by CSP2, the development of the mine and mill site property will require the destruction of more than 28 acres of wetlands and over 900 linear feet of streams. The applicant claims the impacts are unavoidable – no feasible alternatives. Feasible Alternatives A, B, C, D, E, F, G, and H were all discarded as either “not economically viable” or “not prudent” – strongly suggesting that the driving reason for rejecting alternatives is reducing cost, rather than reducing the impacts to wetlands. Even the currently-permitted mine design has been deemed infeasible!

But approximately 1/2 mile east of the proposed mine site is a large block of state forest land. The wetland information in the permit application does not include data on this parcel of land, but it appears to be largely upland forest. Aquila appears to control the minerals on this property, which is adjacent to other Aquila-owned lands.

An alternative that was not considered during previous analyses is moving the mine facilities to an upland site to minimize impacts to wetlands. This location is close enough to the proposed mine site that the increased

transportation costs should not significantly impact the economics of the project. The Preliminary Economic Assessment for the mine shows that change in cash flow is least sensitive to the capital and operating costs, and most sensitive to the metal price and grade (PEA 2012, Figure 1-1). *Since the Michigan Department of Environmental Quality has the responsibility for protecting wetlands, it would be appropriate for MDEQ to evaluate this alternative prior to authorizing the destruction of wetlands where it may not be needed.*

Applicant's "Feasible and Prudent (Least Environmentally Damaging Practicable) Alternatives Analysis (LEDPA)" relies on significant changes to facility design. These changes are assumed, but not yet reviewed or approved. Before wetland destruction can be permitted, the applicant must review alternatives – but the applicant failed to consider moving the mine facilities to an upland site to minimize impacts to wetlands. Moving the mill to an upland site would avoid a number of problems with the current plan, including greatly reducing impacts to wetlands and streams, eliminating potential for uncaptured leachate to reach wetlands and groundwater, and avoiding releasing contaminated water to the river.

It is the applicant's responsibility to identify and evaluate any prudent and feasible alternatives, a responsibility they appear to have left for environmental regulators and reviewers. The applicant dismissed all feasible alternatives except the newly proposed one (identified for the first time in the wetland permit); their excuse for not considering alternatives that would move the milling plant offsite is that doing so would eliminate the already thin profit margin and make the project uneconomical. Meanwhile Aquila Resources' website (<https://aquilaresources.com/projects/back-forty-project/>) proclaims that "The near-surface characteristics of the ore body provide the opportunity to develop a low-CAPEX, high-grade initial phase operation" with an after-tax payback period of 1.8 years. As with the 7-year versus 16-year life of mine, they've got two different stories to tell, based on who their audience is.

LEDPA Alternative B: Applicant Dismissed Off-Site Processing and Tailings Disposal Concept

Applicant admits that off-site processing and tailings disposal is a potentially feasible option, as follows:

"Off-site ore beneficiation can be a viable alternative in certain instances if existing ore processing and tailings disposal sites can be identified **sufficiently close to the ore deposit such that transportation of ore and tailings is economical.** Use of such an existing off-site facility can offer cost savings that offset these transportation costs through the use of such an existing mill and concentrator facilities and an existing open pit for subaqueous disposal of tailings. For example, there is the ore processing and tailings disposal approach used by the Lundin Eagle project in Marquette County. **At that project, ore is hauled from the mine site a substantial distance and then processed off-site at the Humboldt Mill..."**

Aquatic Impacts Criteria

The potential for wetland impacts associated with off-site ore processing and tailings disposal can be considered by examination of the preferred alternative site plan presented on Figure 4-1. The off-site processing/tailings disposal alternative would utilize the same open pit mining method and the same pit perimeter as that included in the preferred alternative. **Direct and indirect impacts to on-site wetlands due to pit development would therefore be similar to those associated with the proposed alternative.** The absence of on-site beneficiation facilities and the reduced footprint required for storage of waste rock would eliminate the need to construct improvements within the footprint of wetland complex WL-B1/B2, thereby eliminating the direct impact to this wetland and reducing the extent and potential of indirect impacts. While tailings would necessarily be stored/disposed off-site under this alternative, waste rock storage would remain on-site, involving a smaller (but still substantial) footprint due to the elimination of the volume occupied by tailings, but include duplicate water management and water treatment infrastructure and facilities. The reduced footprint of the waste rock facility relative to the preferred action tailings and waste rock facility would reduce but not eliminate the temporary loss of tributary watershed area for WL-B1/B2. In addition, **there is no guarantee that the improvements or modifications needed to existing off-site facilities would not implicate additional wetlands impacts** and/or new or increased discharges to surface waters at the off-site location.

Transportation of ore to a distant mill/open pit site would also introduce additional environmental risks and costs not associated with on-site processing and tailings management. **Since it takes substantially more rail car or truck loads to transport ore off-site compared to beneficiated ore concentrate, off-site ore processing increases greenhouse gas emissions associated with the Project, as well as increasing the use of and impact on existing infrastructure.** Ore transport by rail or truck would carry a risk of accidents such as trucks overturning or train derailment in proximity to nearby communities. Either occurrence could result in human injury, ore spillage, and potential environmental contamination over an extended uncontrolled area. Considering the potential for off-site aquatic impacts and long haul distances, the off-site ore processing and tailings disposal alternative, while potentially feasible, is not practical or prudent as further described below.

The applicant swiftly dismisses the “feasible alternative” (actually a package of alternatives) by discussing their economics. There is no detailed examination of the alternative, or possible versions of this alternative. It is “distant” and “costly” and no possible sites are selected or discussed. The fact that there are no maps or photos strongly suggest no zone that was considered, and no actual sites examined. The applicant suggests it would require “costly” and environmentally hazardous transportation of ore “over an extended uncontrolled area.” Because the applicant identified NO potential sites, we are left to imagine the worst - an old mill somewhere else, surrounded by wetlands. Since the review of alternatives is entirely hypothetical, there is “no guarantee” that the alternative would not create “additional wetlands impacts” and require “long haul distances.”

The applicant claims “While tailings would necessarily be stored/disposed off-site under this alternative, waste rock storage would remain on-site.” But tailings are routinely pumped to tailing basins that are considerable distances apart, and waste rock, too, can be transported. There are examples in the U.P. and the Lake Superior region. At Eagle Mine, for example, development rock is being transported underground a distance of 1-5 miles, from the Eagle East access ramp to the Eagle orebody, where it is being used for backfill. Eagle does not claim this is cost prohibitive. No consideration is given to this – the hauling of waste rock from further away from the mine pit – although the Lundin project is used for comparison. Development rock from the underground Eagle access tunnel was hauled through steep upgrade ramps, above ground to a lined Temporary Development Rock Storage Area – then hauled back down to empty stopes when it was needed for backfill, a round trip of at least a mile (plus steep grades).

Simply put, this is not a serious LEDPA review. The logic of the reviewer is roughly: *I could go to the gym to work out, but haven't identified the locations of any gyms, let's assume they all require costly car rides, and that they are all adjacent to fast food restaurants, which would have far worse health consequences, and I might get in a car accident, en route, thus it is healthier to stay home and never go to the gym.* The applicant does not acknowledge that any “feasible off-site” alternatives exist because the search radius is not identified. Sites are all hypothetically distant and costly with potential wetland impacts of their own. The risk of environmental contamination from ore, interestingly, is taken far more seriously than the applicant's plan for transporting chemical reagents, cyanide, filter waste and leachate, or refined product.

Constructability and Technical Feasibility Criteria

In order for an off-site ore processing and tailings disposal to be practicable, it would require the utilization of an existing idled beneficiation plant co-located with a spent open pit, such as the Eagle Mine and Humboldt Mill refurbishing effort where Lundin has demonstrated that such an alternative is technically feasible. Idled processing facilities and adjacent unused pits are present in the Upper Peninsula and could potentially be utilized for subaqueous tailings disposal. Some **sights** with these features exist to the north of the Back Forty site. Practical options for transport of ore to these **sites** are limited to trucking on existing roads and highways, or transport via rail. Neither truck nor rail alternatives present insurmountable construction or technical challenges, although truck transport is regarded as impractical in terms of cost as is described below. However, refurbishing mill facilities, including rehabilitation or replacement of mills and concentrators, upgrades to subaqueous disposal pits, addition of new treatment plants and discharge points etc. can pose substantial technical challenges.

The “sights” (sic) north of the Back Forty are not identified.

Economic Viability Criteria

*Evaluation of the economic viability of the off-site ore processing and tailings disposal is a function of revenue per ton of ore, transportation costs, and costs associated with the acquisition and refurbishing of an existing idled mill and spent open pit. In terms of revenue per ton, the Back Forty deposit does not have the type of uniquely high grades that, for example, support the type of off-site processing arrangement that the Lundin Eagle Mine is able to maintain. Typical ores produced from the Eagle Mine contain approximately 4 percent copper and 7 percent nickel. Ore from the Back Forty resource is lower grade, with a typical ore containing **3 percent zinc, 0.5 percent copper, and 1 to 2 grams per metric ton of gold**. With this grade differential and taking into account the current market prices of these commodities, a given weight of ore from the Eagle Mine generates approximately seven times the revenue that would be produced by the same weight of ore from the Back Forty mine. **Based on project economics, off-site processing is not economically viable.***

The applicant misinterprets Michigan's Review Criteria. First, an alternative must be considered as potentially feasible and prudent if "the alternative is available and capable of being done after taking into consideration cost, existing technology, and logistics" AND "the alternative would have less adverse impact on aquatic resources." Independent review provided by the Center for Science in Public Participation (CSP2) dismisses the applicant's claim that potential alternatives are not economically feasible or prudent. In order to accurately compare economic feasibility of different mines, the ore must be described as AuEq, the gold equivalency (industry standard), rather than % or grade. The applicant did not express economic feasibility in standard terms, making accurate and verifiable comparisons difficult. The applicant dismisses several potentially feasible alternatives, and does not give due consideration to "feasible and prudent alternatives (which) may include any or all of the following: *"(i) Use of a location other than the proposed location. (ii) A different configuration. (iii) Size. (iv) Method that will accomplish the basic purpose."*

LEDPA Feasibility of Alternative B

In their LEDPA analysis, the applicant offers numerous false assumptions. The applicant's minimal consideration of Alternative B makes this clear:

First, they assume that milling must take place at the Back Forty site because "off-site" milling is not *economically feasible*, while they admit that off-site processing is *technically feasible*. Then the applicant conflates a number of feasible alternatives into one, claiming: "In order for an off-site ore processing and tailings disposal to be practicable, it would require the utilization of an existing idled beneficiation plant co-located with a spent open pit, such as the Eagle Mine and Humboldt Mill refurbishing effort where Lundin has demonstrated that such an alternative is technically feasible."

The applicant seems to misunderstand the term "practicable", which means an alternative that is available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes. **The Clean Water Act, regardless of the regulatory authority, establishes "a presumption, for non-water-dependent projects, that practicable alternatives are available to avoid aquatic resources."**²⁹

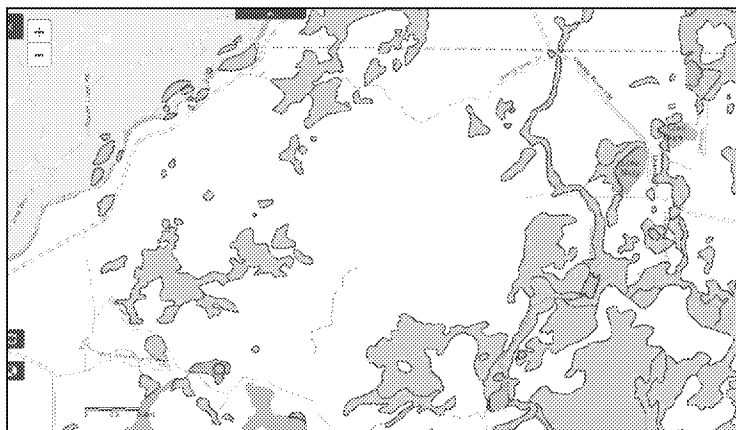
What makes an alternative practicable is not necessarily the existence of co-located facilities or the economics of processing, but the ability to AVOID WETLAND IMPACTS OR HARMS TO AQUATIC RESOURCES.

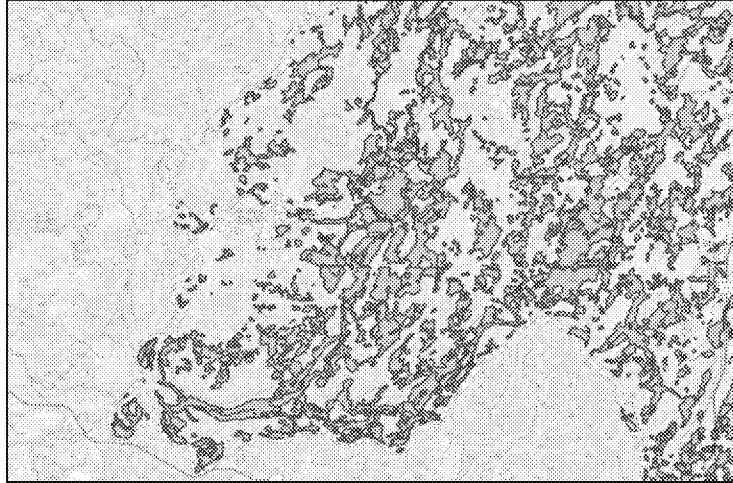
In their review of Alternative B, it becomes evident that the applicant's consideration of off-site milling is extremely limited (REQUIRING an existing idled mill plant, REQUIRING an abandoned open pit mine, REQUIRING the use of subaqueous tailings disposal, REQUIRING long-distance transportation to the mill site). Wetland impacts are hardly mentioned. Multiple arbitrary limitations (a set of at least four difficulties,

²⁹ "MEMORANDUM OF AGREEMENT | §404 of the Clean ... - EPA." 13 Dec. 2017, <https://www.epa.gov/cwa-404/memorandum-agreement>. Accessed 31 Jan. 2018.

bundled together) preclude serious consideration of Alternative B. There is no mention of simply processing ore on a property somewhere nearby, for example – or processing at an idled mill where tailings storage would need to be constructed – or building a new processing plant adjacent to an old spent pit mine, and so forth. The applicant overlooked more options than were evaluated.

- *Clarify: how large was the search radius used by the applicant in reviewing “existing idled beneficiation plants.” 1 mile? 5 miles? 50 miles?*
- *Did the applicant identify any former industrial sites or brownfields? Were industrial sites in the city of Menominee evaluated, for example, or historic mills in the Iron Mountain area? Which ones?*
- *Did the applicant identify ANY spent pit mines, and if so, where were these sites located?*
- *How many miles can Back Forty feasibly transport material before it is determined to be “not economically viable”? 1 mile? 5 miles? 50 miles? Applicant seems to claim “0 miles.”*
- *Does the entire Back Forty project become “not economically viable” unless all mine waste is dumped or stockpiled adjacent to the open pit? Can tailings be constructed at a different site, and pumped to that site by pipeline (as is common at other regional mines)?*
- *How far can Back Forty ore and waste-rock be feasibly transported: could waste and ore be transported by truck a short distance, or perhaps by spur rail, to a nearby site without wetlands, and returned to the open pit at closure, for backfill and remediation?*
- *Did the applicant identify ANY potential milling sites in the project area or on surrounding land with fewer wetlands?*
- *Since the activity is proposed to take place, in part, on land currently owned by the State of Michigan (SOM) – forest lands where the applicant controls the mineral rights, has negotiated a surface use agreement, or is proposing a land swap – did the LEDPA review consider other SOM lands? If not, why?*
- *Is there any site with fewer wetlands located within a 5 mile radius? Consulting NWI maps appears to provide a few possible upland locations, yet no consideration of these realistic options was offered by the applicant, and no NWI maps were included in the LEDPA demonstration to support claims that wetland impacts were avoided or minimized to the greatest extent possible.*





Rather than give serious consideration to Alternative B – or any other alternative – the applicant neatly dismisses each alternative as not feasible. According to the Michigan Administrative Code Review Criteria, alternatives may be considered a feasible and “least environmentally damaging practicable alternative” (LEDPA) – even in cases where this would require property not currently owned by the applicant, and even in situations where the LEDPA is not the most profitable for the applicant. Rule 281.922a (Permit application review criteria) of Michigan’s Administrative Code states:

- (8) Unless an applicant clearly demonstrates otherwise, it is presumed that a feasible and prudent alternative involving a non-wetland location will have less adverse impact on aquatic resources than an alternative involving a wetland location.
- (9) An area not presently owned by the permit applicant that could reasonably be obtained, utilized, expanded, or managed in order to fulfill the basic purpose of the proposed activity is a feasible and prudent alternative location.
- (10) An alternative may be considered feasible and prudent even if it does not accommodate components of a proposed activity that are incidental to or severable from the basic purpose of the proposed activity.
- (11) An alternative may be considered feasible and prudent even if it entails higher costs or reduced profit. However, the department shall consider the reasonableness of the higher costs or reduced profit in making its determination.”³⁰

Applicant Fails Burden of Proof - LEDPA

Under both Michigan and federal permitting, the Least Environmentally Damaging Practicable Alternative review is considered fundamental, perhaps the most critical test of any wetlands proposal:

“The LEDPA requirement is an attempt to avoid environmental impacts instead of mitigating them... if destruction of an area of water of the United States may be avoided, it should be avoided.... The LEDPA involves two separate determinations; it must be both practicable and the least environmentally damaging. The LEDPA requirement's purpose is “avoiding significant impacts to the aquatic resources and not necessarily providing either the optimal project location or the highest and best property use.”

³⁰ Part 303, Wetlands Protection, Rules. Michigan DEQ, Land And Water Management Division, Wetlands Protection. http://dmbinternet.state.mi.us/DMB/ORRDocs/AdminCode/978_2011-015EQ_AdminCode.pdf (February 1, 2018).

The applicant failed to **evaluate non-aquatic sites or less environmentally damaging aquatic site alternatives**, as required under the LEDPA. Their review of alternatives appeared weighted to consider economic feasibility or processing logistics, rather than impacts to wetlands.

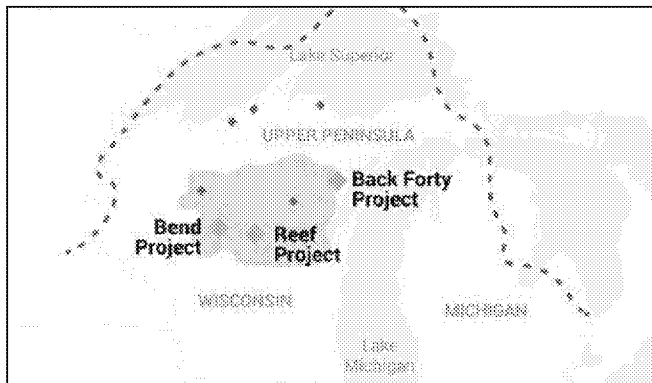
Michigan's delegated authority for Wetlands permitting requires the applicant to meet the LEDPA standard.: MCL §324.30319 R281.922a: *"applicant shall bear the burden of demonstrating that an unacceptable disruption to aquatic resources will not occur as a result of the proposed activity and demonstrating either of the following: (a) **The proposed activity is primarily dependent upon being located in the wetland.** (b) **There are no feasible and prudent alternatives to the proposed activity.**"*

The Back Forty project is clearly not a wetland-dependent activity. Wetlands are not "essential" to the mining activity, they are merely **impediments**. Many of the proposed impacts to wetlands could be entirely avoided if milling were removed from the proposal, or performed elsewhere – at a "non-aquatic site or less environmentally damaging aquatic site." The application failed to identify and offer a serious review of such locations.

While the burden of proof rests squarely upon an applicant, we have identified numerous examples of feasible alternatives that were overlooked in Aquila's LEDPA review, which substantiates our own conclusion that the **applicant failed to identify and consider all feasible alternatives**.

For example, the applicant has failed to give serious consideration to milling solutions utilized by other regional mining companies with sulfide orebodies:

- Lundin Mining, for example, does not process ore on-site at Eagle Mine in Upper Michigan: "truck loads are covered before passing through the truck wash and continuing off site to travel approximately 66 miles to the Humboldt Mill" (one way hauling mileage). The Humboldt Mill site was contaminated and abandoned by its prior owner, and is under CERCLA consideration; Eagle Mine modernized the old mill buildings, and is filling the Humboldt Mill pit with reactive mine waste (subaqueous tailings disposal). Eagle Mine originally proposed to ship their unrefined ore to Canada by rail.
- The PolyMet Mine in northeastern Minnesota proposes to mine and mill ore at separate locations, producing similar waste tailings. PolyMet's ore will be transported 8 miles (by rail) from the mine site to an historic mill site, which the company intends to "modernize."
- Aquila has drawn multiple comparisons between the Back Forty proposal and the former Flambeau Mine in Wisconsin, another sulfide orebody, but has failed to consider Flambeau as a model in their LEDPA. The Flambeau Mine used an open pit, located next to a river – although the pit was considerably smaller, with a short life of mine. Flambeau's ore was NOT milled on-site: it was shipped unrefined, by rail, to be milled and smeltered abroad.
- Aquila Resources has identified potential sulfide mines for two additional orebodies: the "Bend project" (Taylor County, Wisconsin) and "Reef project" (Marathon County, Wisconsin). According to the applicant's website, "The Reef Gold project is located approximately 99 miles west of the Back Forty project" and Aquila's "Bend Deposit" is located 190 miles west of the Back Forty project." According to media statements made by Aquila Resources, they believe that ore from these sites in Wisconsin could be shipped to the Back Forty for processing. Applicant should explain why the reverse is not true: can Back Forty ore be shipped to a milling facility in Wisconsin? Since the Back Forty mine is located on the state line, was this evaluated (not included in the LEDPA review)? Which potential sites were identified in Wisconsin?



- The LEDPA review does not provide maps showing the radius used for feasibility review, or a list of estimated distances to existing industrial processing sites, historic mills, spent or active pits, spent or active quarries, brownfields, building sites where some but not all of the (milling) project's needs could be met, additional lands that could be purchased, or other potentially feasible milling alternatives. The applicant did not even provide a map showing all of the locations where THEY own land in Menominee County.
- Under the Criteria for Review: "A feasible and prudent alternative may include any or all of the following: (i) Use of a location other than the proposed location. (ii) A different configuration. (iii) Size. (iv) Method that will accomplish the basic project purpose. The applicant shall demonstrate that, given all pertinent information, there are no feasible and prudent alternatives that have less impact on aquatic resources..... (9) **An area not presently owned by the permit applicant** that could reasonably be obtained, utilized, expanded, or managed in order to fulfill the basic purpose of the proposed activity is a feasible and prudent alternative location. (10) **An alternative may be considered feasible and prudent even if it does not accommodate components of a proposed activity** that are incidental to or severable from the basic purpose of the proposed activity. (11) An alternative may be considered **feasible and prudent even if it entails higher costs or reduced profit.**"

After reviewing the Applicant's "Least Environmentally Damaging Practicable Alternative" conclusions, we cannot agree that the selected design is "the LEDPA."

The applicant failed to include basic economic information necessary to substantiate their claim that the **selected facility design** is the project's only economically feasible alternative. Aquila's review of LEDPA alternatives failed to evaluate economically feasible solutions used (or proposed) by other nonferrous metallic mines in the region. For example, milling facilities could be moved to another location, to minimize impacts to wetlands – but the applicant's review of feasible alternatives failed to identify any non-aquatic sites or sites where there would be less impact to aquatic resources.

The applicant's claim that ore cannot be transported to an off-site milling facilities ("not economically feasible") contradicts published statements made by Aquila in Wisconsin: **"The company has stated that gold ore mined at the Reef deposit could be shipped to and processed using cyanide at its proposed Back Forty mine processing plant in Michigan along the Menominee River."**³¹

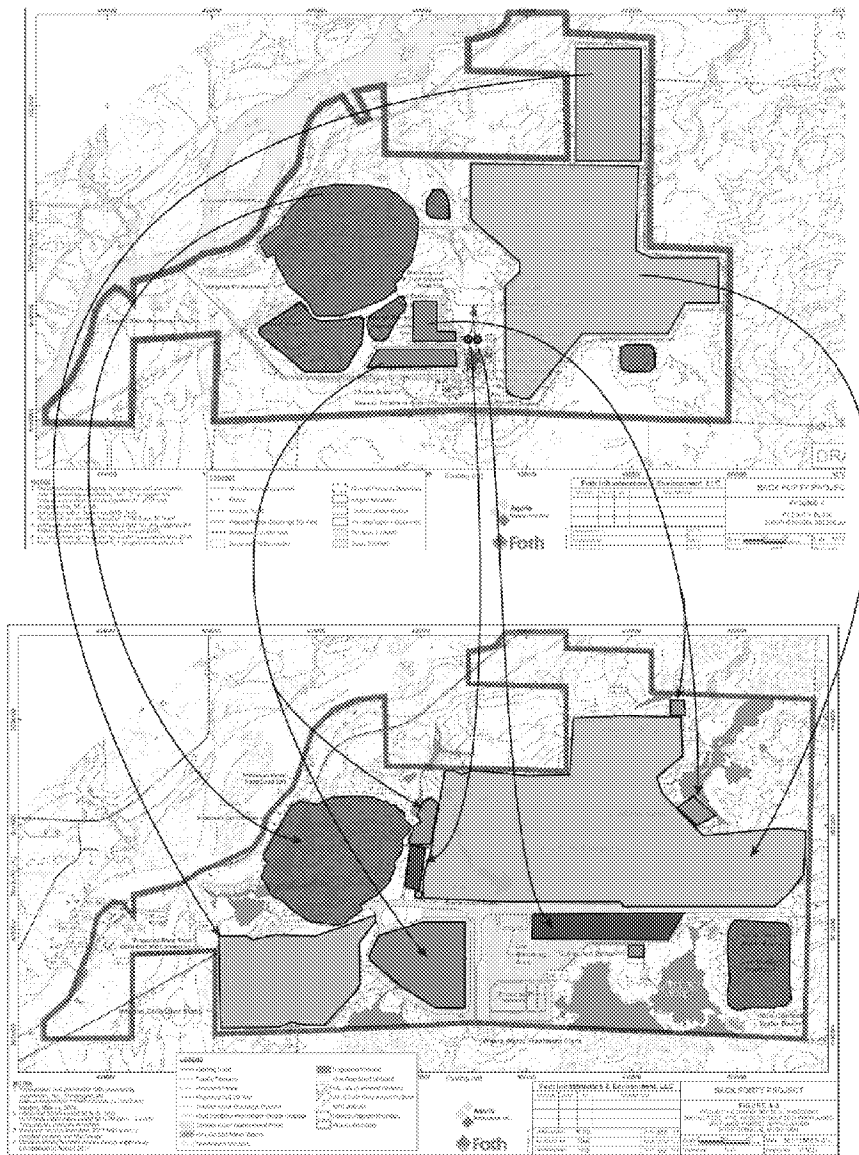
Applicant's LEDPA Relies Upon "Significant Changes" to the Mining Permit; Mine and Mill Facility Design Changes Were Not Reviewed or Approved

Since the Mining permit was issued by Michigan DEQ on December 28, 2016, the Back Forty site has been extensively redesigned. Changes impact critical components such as the project boundary, affected

³¹ "Sierra Club Statement on Signing of Mining Give-Away Bill | Sierra Club." 11 Dec. 2017, <https://www.sierraclub.org/wisconsin/blog/2017/12/sierra-club-statement-signing-mining-give-away-bill>. Accessed 31 Jan. 2018.

area, location of haul roads, relocation of mine waste (tailings) storage areas (TWRMFs), sumps, contact water basins, ore stockpiles, and beneficiation (milling) buildings. The edge of one waste rock storage area, which may be used for tailings (unclear), is now approximately 1,000 feet from the Menominee River.

A review by the Center for Science in Public Participation (CSP2) concluded that “The mining permit and wetland permit are inextricably linked.” None of these significant facility changes have been reviewed or permitted – the site design changes are simply assumed to be factual. This is a fundamental concern in reviewing the wetland permit – we find that the design is likely still subject to significant revisions, and it seems premature to use the unpermitted design as the basis for this permit.



In the Wetland Permit feasibility analysis, the applicant claims that the new (unreviewed, unapproved) **facility design is the “Least Environmentally Damaging Practicable Alternative.”** But these are significant changes, and we disagree that the selected facility design represents the LEDPA.

After reviewing the scope of the changes, we asked the Michigan Department of Environmental Quality to immediately subject the Back Forty Mine permit to an Amendment Request, as required under Part 632, which regulates the design, construction and operation of mining and milling facilities. Our request was submitted on December 8th, accompanied by an illustration (above) showing the expansion and significant reorganization of the mine site, comparing the facility design shown the December 2016 Mining Permit, as issued, and the facility design shown in the December 2017 Wetland Permit application:

Significant Changes to Aquila Back Forty Mine Permit

Letter from Mining Action Group to the Michigan DEQ, December 8, 2017

<http://savethewildup.org/wp-content/uploads/2017/12/Aquila-Back-Forty-Part-632-Amendment-Request.pdf>

The DEQ OOGM responded on December 11, 2017, stating that the Back Forty's Mining Permit would not be amended until *after the Wetland Permit was decided*.

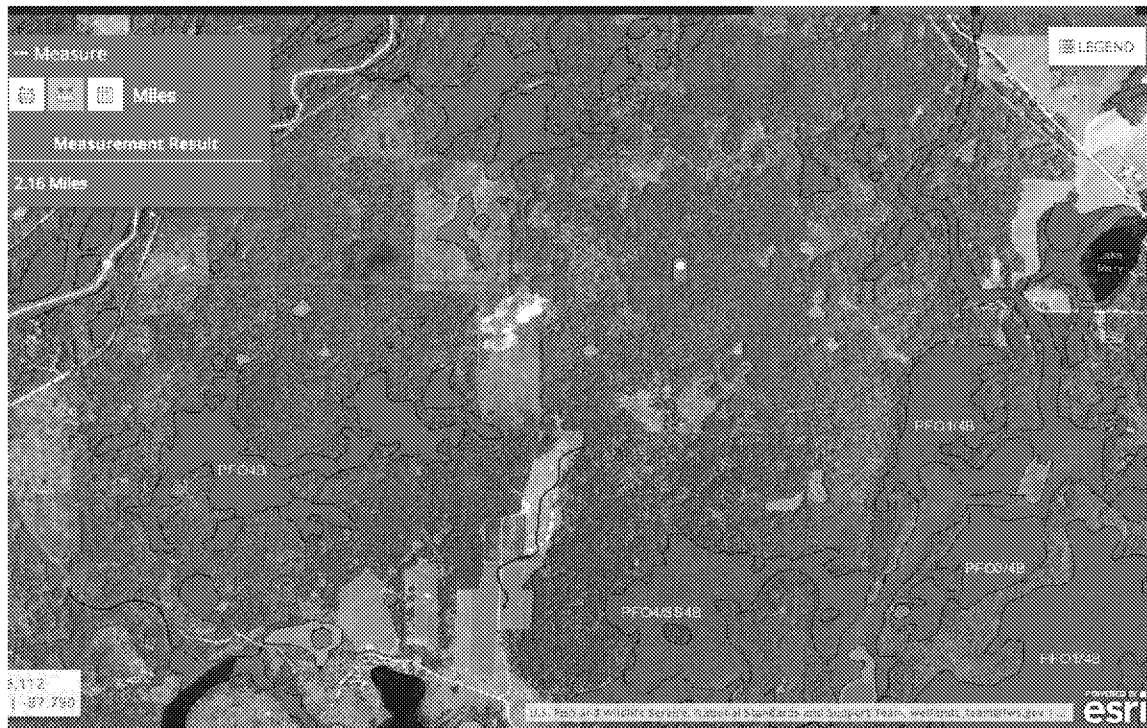
This answer disregards of the EPA's August 15, 2016 letter to Colleen O'Keefe of the DEQ's Land and Water Division, which directed the DEQ to require *“A finalized site plan” before considering approval of a wetland permit application for Aquila*.

We are extremely disappointed by the DEQ OOGM's refusal to consider the impacts of these site changes in a consolidated hearing process. The public should have been given an opportunity to review the revised facility design and its impacts, as regulated by the Mining Permit, at the same time that the design is used as the basis of the Wetland Permit application, now under review. Segmentation of these interconnected permits into separate reviews effectively undermines meaningful public participation, and steamrolls the permitting process.

New Utility Corridor identified in Wetland Permit

According to the Wetland permit, **“A proposed east access corridor to provide additional power service to the mine facilities is currently being evaluated by American Transmission Company (ATC).** If approved, the proper easements and permitting will be completed by ATC as a separate project. Based on-site reconnaissance and wetland delineations completed on that proposed power corridor, there are no wetland impacts that will need to be permitted or, therefore, mitigated.”³² In fact, the “power corridor” would connect with the existing transmission grid less than 200 feet from the Shakey River, and appears to skirt several wetlands, although detailed corridor plans have not been provided.

³² 1 R-Wetland Permit Application Oct 2017 Reduced Sections 1-5.pdf page 134.



*Please clarify – will construction along this corridor really have **no wetland impacts**? Or is the applicant stating that any wetland impacts would be attributed to the American Transmission Company rather than to Aquila Resources?*

The “proposed east access corridor” is a new feature of the facility plan. This phrase does not appear in the applicant’s mining permit (2015, issued 2016) – although Rule 103 of Part 632 clearly defines “mining activities” to include construction of mine facilities and associated infrastructure, including “(xi) Construction of utilities or extension of utilities”. Furthermore, Rule 202, Environmental impact assessment, states that “(1) The environmental impact assessment required under R 425.201(1)(c) shall include, but is not limited to, the following:”....., which included, “(q) Existing and proposed infrastructure and utilities.”

While the corridor was recently reviewed for potential wetlands (2017), it seems the proposed utility corridor was not **fully assessed for impacts to rare species or other features** under the EIA process. For example, no engineering schematic was provided for the proposed corridor, which roughly aligns with an existing unpaved forest trail.

Utility Corridor – Uncalculated Impacts

What are the potential impacts to wetlands or other aquatic resources along the path of the applicant’s “Utility Corridor” (running northeast, from the west side of the mine site to a proposed electrical grid connection (“WE-Energies Electrical Transmission Line”)? The applicant stated their intent to have American Transmission Co. (ATC) permit the corridor work independently. Shouldn’t all mining utility-related disturbances to wetlands and natural or cultural resources be attributed to the Back Forty project? The utility corridor would cut through adjacent Escanaba State Forest Land where the applicant controls mineral rights.

This “Utility Corridor” issue warrants additional scrutiny for several reasons:

- The “utilities corridor” was referenced in the past Part 632 permit, but cumulative impacts were not fully assessed, since the corridor plan had not been articulated.

- The existence of this corridor was not mentioned in the LEDPA review.
- Some of the EIA baseline studies (invasive species, archaeological study) reviewed a narrow zone of land along a forest road, apparently aligned with the utility corridor, but other studies did not review this area.
- What are the likely impacts to archaeological resources along the “utility corridor”? For example: the archaeological study identified site “20ME118” (on the utility corridor) as an historic structure with “Possible National Register eligibility” (1930s cabin).
- All natural and cultural impacts should be included as direct or indirect or cumulative impacts from the mining operation.
- One of the potential vulnerabilities in Michigan Wetlands program concerns *utilities, and the exemptions applicable to utility, gas, and oil lines*. Were forests and wetlands along this route assessed for T/E species such as the Northern Long-eared Bat? Are there any exemptions or additional requirements, such as NLEB surveys, that would apply to a utility project or road project (such as use of public funds) on State Forest Land?
- Has the applicant formally proposed rerouting River Road (or a new access road) to align with their proposed “utility corridor”, connecting the east side of the Back Forty site with Highway 356? Will bridges or bridge upgrades be required?

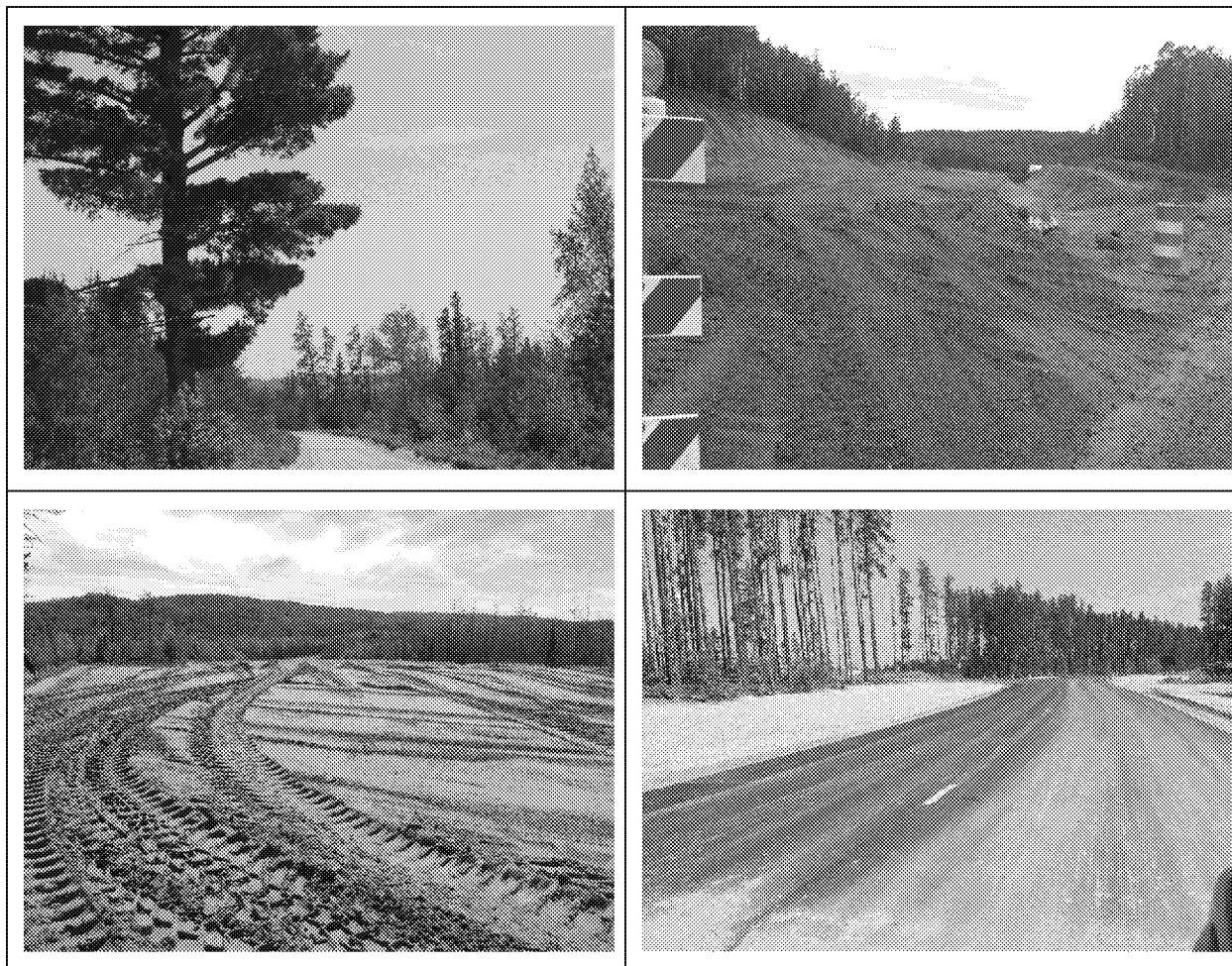
Is the Utility Corridor a “Future Access Road Corridor”?

In the original EIA, archaeological survey work includes the following statement: *“a 1.5 mile potential future access road corridor was also examined using the meandered search method. A corridor alignment representing a width of 66 feet was premapped and represented on a Garmin 60CSx GPS unit. Using the mapped corridor information as a guide, wetland ecologists examined the corridor both on foot as well as by driving a closely parallel forest trail.”*

The width (66 feet, the width of a standard primary county road width of 42 feet, including ROW) suggests the true purpose here was not a power corridor, a private haul route or employee access road, but a potential County Road project. The existing unpaved “forest trail” meanders, dictated by topography, but the “potential future access road corridor” is a straighter line. In our experience, the difference in width between the existing rustic forest two-track, and a potential “closely parallel” County Road project could be extremely significant, in terms of impacts to natural and aquatic impacts and state forest lands. It is unclear whether the “66 feet” surveyed corridor was designed to avoid wetlands, but the original survey width may have been too narrowly defined to reveal the true extent of wetland impacts.

The building of a haul road or access road is a reasonable and foreseeable impact. Upgrading an unpaved forest road to meet “County Road” construction standards, for the purpose of providing a haul route (and the reroute of the River Road), should be anticipated. All potential impacts should be attributed to the applicant’s project (not Menominee County, or American Transmission Company). A similar project in Marquette County, recently undertaken by the Marquette County Road Commission to benefit Eagle Mine, resulted in an “unpaved forest trail” through a wild, undeveloped area becoming an excessively wide, paved highway – with pavement ending at the gate of the mine.

Cumulative environmental impacts from haul roads should be attributed to mining companies. It is alarming that a haul road plan was not included in the Mining Permit; the Wetland permit continues to build upon this error. Photos taken during Lundin/Eagle Mine haul road construction illustrates the significant extent of potential environmental impacts:



It is reasonable and foreseeable that the “utility corridor” will soon be proposed for a new “haul road” for the mine.

First, the applicant has not defined an acceptable haul route solution. Using River Road would send employees and industrial truck traffic through a narrow road in a scenic area, threatening the Shakey Lakes, Shakey River and the Shakey Lakes ERA, among others, and negatively impacting the Shakey Lakes County Park. Second, the “east access corridor” conveniently connects the milling site with Highway 356: this road runs diagonally between the We Energies’ White Rapids dam (and a bridge crossing to Wisconsin) and US-41 (Stephenson, MI). Third, if a new road segment (~ 2.25 miles in length, along the southern boundary of the project) were proposed, connecting the severed River Road with the applicant’s “east access corridor”, this potential route would solve Aquila’s transportation problems at the expense of wetlands. Any connecting road segment, which seems reasonable and foreseeable, would cut through several wetland complexes, resulting in a significant increase in the applicant’s wetland impacts (both direct and indirect). We are pointing this out not to be speculative, but because the additional wetlands impacts related to the applicant’s transportation and access corridor remain extremely likely – and because these impacts are NOT ADDRESSED by the wetland permit application.

From a regulatory perspective, the complete absence of a transportation plan (access road, River Road) information should be troubling. The applicant appears to be seeking tacit approval, via the Wetland permit, for as-yet-undefined core aspects of the mining operation which are intended to be regulated by

Part 632. The utility corridor was not described in the previously permitted mining permit, nor was a detailed transportation plan described, and the details of the “corridor” are still not open to public comment (design not provided). Incremental changes are likely; the result is an unrecognizably altered or fragmented landscape. This corridor upgrade could bypass the cumulative impacts assessment requirement.

Facility Design Changes

No less than four possible future layouts of the mine are shown in 2 R-Wetland Permit Application Nov 2017 reduced Sections 5-7 rev Dec 2017.pdf , Figure 4-9, PDF 364. Maps of the old layout are included just before this. Despite the fact that the mining permit has been issued, the layout seems to be undefined, subject to change according to the applicant’s needs relative to the permit being applied for. The new mine layout proposed in the wetland permit includes a major processing change (see Volume II, Figure 4-7). As pointed out by Zamzow in the review by CSP2, the separate waste rock facility proposed in the mine layout that was permitted in 2015 included separate flotation and oxide tailings and waste rock management facilities (TWRMF). For this wetland permit application, this layout was discarded, and a new plan put forth that simply deposits two types of tailings into a common “mine waste storage area.” The change in the physical distribution of the tailings, and the spatial change in tailings chemistry across the site undoubtedly has an impact on infiltration of precipitation and contaminants into these wetlands. And not separating the more reactive (high-sulfide) tailings will result in some of these tailings being left on the surface in perpetuity, rather than being backfilled into the mine pit, where they can be isolated from atmospheric oxygen by water.

Facility Design Changes Do Not Minimize Aquatic Impacts

Regardless of the configuration, a significant portion of wetland impacts are directly attributable to the construction of milling facilities, including stockpiles, and tailings waste storage areas.

Facility Design Changes May Increase Sediment Loading of Wetlands

Sedimentation is a largely overlooked concern in the wetlands permit. Facilities, including open-air blasting and a complex of haul roads within the site, exacerbated by an industrial footprint that directly abuts wetland areas, will produce high quantities of dust. What will the dust at the mine site be composed of? The Back Forty site contains: “13 rock lithologies (rock material with distinct crystal and/or chemical features). **These are important to understanding the characteristics of waste rock and tailings.** Virtually all (88%) of the rock material in the pit consists of six lithologies; the sulfide stringer zone (SFST) makes up 8% of the material and massive sulfide (MASU) makes up 6% (EIA Appendix B, Report 1, §2.1). **It is important to note that the lithology that makes up most of the host rock... also contains pyrite (FeS₂), chalcopyrite (CuFeS), sphalerite ((Zn, Fe)S), and arsenopyrite (AsFeS) – all material that can produce acid; it contains no buffering material (...)** Although MASU and SFST only make up 14% of the pit rock, virtually all lithologies have over 10% sulfide material. In the mining permit, the term “low sulfide” is used for material with less than 10% sulfide, but the geochemical testing indicated that material with over 0.3% sulfide was likely to go acid”

Most of the rock proposed to be blasted, transported and processed at the Back Forty – Massive Sulfides ores, Sulfide Stringer Zone and even “low sulfide” materials – are a high risk for acid rock drainage. Dust produced at the site will further threaten the water chemistry of aquatic resources on the mine site, and in the surrounding area.

“Design of wetlands for sediment control must consider the quantity and characteristics of the sediment anticipated over the life of the project. If the expected sediment load is so great that it would require periodic removal and proper disposal of sediment, then construction of a sediment basin may be a more

appropriate solution to the problem. **The best way to deal with sedimentation, however, is to take corrective actions at its source.**"³³

Additional LEDPA Concerns

- Relocation of Mine Waste Storage Areas: In order to minimize previously unanticipated or undisclosed impacts to wetlands and streams in the project's northeast corner, the entire mine plan has been rearranged. Yet this significant change is poorly explained. For example, in Figure 4-4 of Volume I of Aquila's wetland permit, the two "Mine Waste Storage Area" facilities are not labeled to indicate which portions will be permanent. Likewise, "mine waste" types (oxide, flotation, waste rock) were previously segmented, but the new design appears to intend commingle wastes.
- What potential environmental impacts to Menominee River and Shakey Lakes are posed by an **additional waste storage area** – potentially a permanent feature of the mine site – moving closer to these waterbodies?
- What are the impacts to the adjacent Shakey Lakes ERA? Shifting the milling facility and waste rock away from the river would have significant benefits to wetlands, important natural resources, and the larger ecological-cultural landscape. **Environmental impacts were not assessed for this new design; the Shakey Lakes ERA, adjacent to the Menominee and the Project Site, was not identified in the LEDPA.**
- What is the reasonable and foreseeable potential that "Indirect Impacts to Wetlands" are intentionally underestimated in the Back Forty Wetland Permit, in light of the company's public statements that ore from deposits in Wisconsin (Aquila Resources' "Bend Project" and "Reef Project") could be transported to Michigan for processing at the Back Forty mine site? This is a "foreseeable" concern. The prospect was previously disclosed to Aquila's investors, who were told that the Bend and Reef orebodies could be processed in Michigan: "significant potential to add to and compliment (sic) Aquila's interest in the Back Forty project. The **proximity of these projects to potential processing infrastructure** (gold and base metal circuits) at Back Forty enhances their value..."³⁴
- The Back Forty milling facility, if permitted, could become a regional industrial hub, processing sulfide ores from multiple properties, and magnifying concerns about the long-term production and storage of toxic mine waste on this site. In the Wetland permit, the applicant does not acknowledge the real potential for a long-lived sulfide ore milling facility on the Menominee River, "processing infrastructure (gold and base metal circuits) at Back Forty" which may continue operating long after the Back Forty ore has been extracted. The applicant proposes a short lived project, open pit mining only, followed immediately by closure and remediation. Yet it is reasonable and foreseeable that Aquila's proposed mill would accept additional ore for processing, extending the life of the mine for an undetermined duration. Similarly, the Back Forty's mine waste storage areas, which have already increased in size and number under the new facility design, could be used for additional years, and/or expanded through incremental permit revisions, creating longer term hazards to aquatic resources, and greater direct and indirect impacts to wetlands. **These plans, and their potential additional wetlands impacts, were not fully disclosed by the applicant.**
- What is the "reasonable and foreseeable" potential that Aquila's Back Forty Wetland impacts are being vastly underestimated, in light of a new wholly-owned subsidiary, Aquila Nickel, now conducting exploratory drilling for copper-nickel and platinum group elements at the "Sturgeon Falls Sill" on the Menominee River, 22 miles north of the Back Forty site? Despite the applicant's claims, in the Back Forty LEDPA review, that transportation to an off-site mill would be

³³ Living with Michigan Wetlands, https://www.watershedcouncil.org/uploads/7/2/5/1/7251350/living_with_mi_wetlands.pdf

³⁴ Applicant has stated "gold ore mined at the Reef deposit could be shipped to and processed using cyanide at its proposed Back Forty mine processing plant in Michigan along the Menominee River." Source: Sierra Club. <https://www.sierraclub.org/wisconsin/blog/2017/12/sierra-club-statement-signing-mining-give-away-bill>

cost-prohibitive, it is extremely reasonable and foreseeable that ore from any additional orebody in the general area, such as Sturgeon Falls site, would be shipped to the Back Forty mill for processing. The economics of building two processing facilities in close proximity would be cost-prohibitive - transportation costs would pale in comparison. The applicant fails to acknowledge this real possibility in the discussion of wetland impacts, the LEDPA review, or the remediation discussion. Remediation of the milling facility will likely be deferred by decades of additional milling.

- **While the applicant's LEDPA review bundles the project together, the "reasonable and foreseeable" impacts of a nonferrous metallic sulfide MILL are entirely different from those of a nonferrous metallic sulfide MINE.** Orebodies are pursued until exhausted, whereas processing mills are updated, repurposed, sold, remodeled, expanded to include "new processing methods", periodically shuttered and reopened, abandoned, eventually (hopefully) remediated, etc. The life cycle of the milling operation is very different from the mine's life, which is dictated by the ore reserves.
- The Back Forty mine represents shorter-term hazards for surface waters, while the Back Forty mill is a long-term hazard whose full impacts are not disclosed. It is misleading for the applicant to propose a short mill life, or a swift reclamation of the mill site. All of the direct and indirect wetland impacts should be segregated by source, **mine** or **mill**, in order to clearly isolate the mill's impacts – waste storage impoundments, roads, buildings, etc., and the hydrological impacts of an industrial site which is likely to persist, expand, and/or produce additional long-term impacts to wetlands and aquatic resources.

§7. Summary of Environmental Studies

§7 is found in Volume II: [2 R-Wetland Permit Application Nov 2017 reduced Sections 5-7 rev Dec 2017.pdf](#)

Incomplete Analysis of Wetlands

Flawed or non-representative data was gathered during the (drought) years that the Wetland Surveys were completed. In the case of Wetland 4A this led to the misclassification of regulated wetlands as non-regulated wetlands (see DEQ letter to Aquila, Vol II). Over one-half acre of Wetland 9 was "missed." Incomplete analysis of the site's hydrology also led to the omission or misrepresentation of a headwater stream. Given that baseline surveys were collected in low water years, the true wetlands impacts may be much greater than the company's estimate of 17.2 acres impaired and 28.4 acres destroyed (Vol I, Table 3-1).

§8. Proposed Wetland and Stream Mitigation Plan

§8 is found in Volumes III, IV and V:

§8A: [3 R-Wetland Permit Application Nov 2017 reduced Section 8A.pdf](#)

§8B: [4 R-Wetland Permit Application Nov 2017 reduced Section 8B.pdf](#)

§8C: [5 R-Wetland Permit Application Nov 2017 reduced Section 8C.pdf](#)

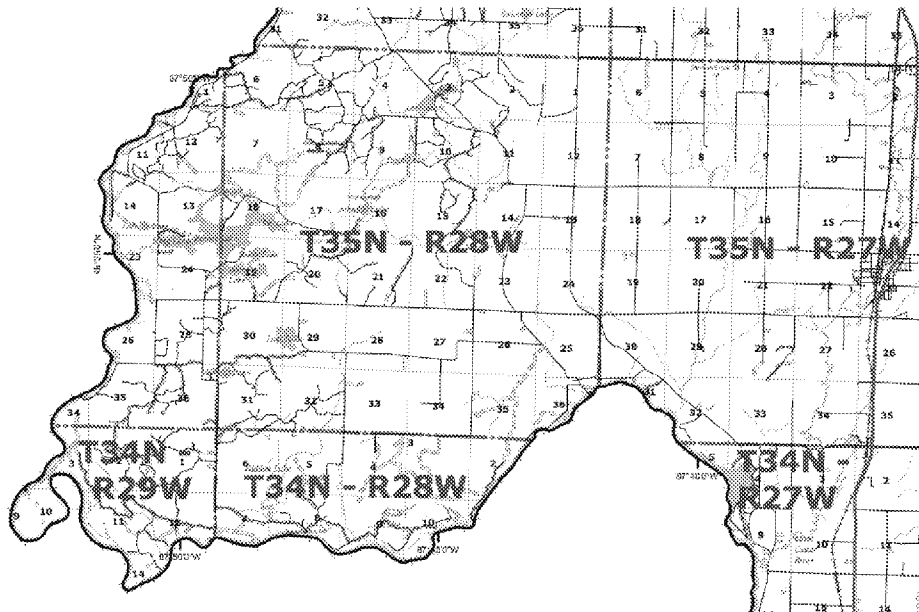
Non-Regulated Wetlands Also Impacted

"Wetlands regulated under Part 303 will be impacted by the proposed construction. Non-regulated wetlands will also be impacted but are not addressed in this mitigation plan."

"The applicant proposes to **impact 28.4 acres of wetland and 550 linear feet of stream** by constructing a polymetallic open-pit mine with above-ground tailings disposal and rock management facilities, on-site wastewater management facilities, and operations and stormwater management facilities. The project proposes to excavate approximately 980,820 cubic yards of material from 5.3 acres of wetland and place approximately 803,453 cubic yards of fill in 5.9 acres of wetland and 253 linear feet of stream channel. The

project also proposes **reductions in surface water inputs that would impact 17.2 acres of wetland and 297 linear feet of stream channel**. The project also proposes the instillation of a 15-inch diameter outfall pipe within the 100-year floodplain of the Menominee River and an associated 11 cubic yards of riprap water ward of the ordinary high water mark of the Menominee River for the purpose of erosion control.

"As compensatory mitigation for the impacts to aquatic resources, the applicant is proposing the preservation of existing aquatic resources through placement of a conservation easement and perpetual long-term management of a 507.74 acre parcel of property in Lake Township. The parcel contains 294.24 acres of existing wetland, 7,864 linear feet of perennial stream, and 4,794 feet of Menominee River frontage."



Stream Restoration Goals and Monitoring Plan

"River and stream restoration projects are increasingly numerous but rarely subjected to systematic postproject evaluation. **Postproject evaluation must be incorporated into the initial design of each project**, with the choice of evaluation technique based directly upon the specific project goals against which performance will be evaluated."³⁵ In the long term, how will the success of the proposed stream restoration be evaluated and ensured? Will the results of the stream restoration project be examined and shared? The viability of the stream restoration project is a key concern, since streams on the mine site are proposed to be lost.

In terms of assessment and post-project monitoring, stream restoration projects have a poor track record: **"Two decades since calls for stream restoration projects to be scientifically assessed, most projects are still unevaluated, and conducted evaluations yield ambiguous results."**³⁶ "Where possible, geomorphic, hydrologic, and ecological variables should be measured along the same transects. In general, postproject monitoring should continue for at least a decade, with surveys conducted after each flood above a predetermined threshold. Project design should be preceded by a historical study documenting former channel conditions..."

³⁵ Kondolf, G.M. & Micheli, E.R. Environmental Management (1995) 19: 1. <https://doi.org/10.1007/BF02471999>

³⁶ Rubin, Z.; Kondolf, G.M.; Rios-Touma, B. Evaluating Stream Restoration Projects: What Do We Learn from Monitoring? *Water* 2017, 9, 174.

³⁷Applicant's Stream Mitigation Plan - Fish Surveys Failed to Identify Expected Species (Smallmouth Bass, Walleye, Northern)

The applicant stated that their fish survey found no sturgeon or sturgeon eggs, although biologists estimate there are only 3,000 sturgeon of breeding age in all of Lake Michigan, down from an estimated two million of them at the turn of the century. Their population will not expand unless they can reach spawning habitat. The Menominee River, likely the birthplace of many old sturgeon in Lake Michigan, is ideal habitat. In Volume VIII, Appendix B, the applicant noted that lake sturgeon were a dominant species found in ERM's studies, completed a decade ago: "Dominant species across the Menominee River sampling locations were black and brown bullhead, redhorse species and **lake sturgeon.**"

Applicant's Wetland Mitigation Site Cannot be "Preserved in Perpetuity"

The planned Back Forty open pit mine and Tailings Waste Rock Management Facility basins (TWRMF) hinge on a single underlying assumption: that the State of Michigan will agree to a proposed LAND SWAP with Aquila Resources. A portion of the open pit, and much of the facilities, are proposed to be constructed upon lands that are currently owned by the State of Michigan, and contingent upon the undecided land swap. If approved, the land transaction would result in the disturbance or destruction of tribal archaeological resources, destruction of populations of rare plants, degradation of water quality (NPDES discharges), and impairment of Menominee River fisheries, regulated wetlands, and other aquatic resources.

It is important to understand that the applicant's proposed Compensatory Wetland Mitigation is the same land the applicant has proposed to exchange with the State of Michigan. According to the Michigan DNR, Aquila first proposed the land transaction in 2011. The Aquila land swap requests have been dropped once (in 2012, by Aquila) and rejected twice (in 2011 and 2015), for a variety of concerns. At this time, the Michigan DNR asserts that "no decision has been made." The latest iteration of the land transaction is not under review, is not scheduled for review, and has not been subjected to public comment. **The mitigation proposal, questions of ownership, the conservation plan, and long-term mitigation and management plans are interwoven with the Aquila Land Swap, making it extremely difficult to independently evaluate the merit, adequacy or feasibility of the Compensatory Mitigation proposal. We have contacted the Michigan Department of Natural Resources to register our concerns about this unresolved issue.**

We previously submitted written comments on the "Land Swap" issue:

- Letter to Michigan DNR, "Objections to Land Swap between State of Michigan and Aquila: A Done Deal?" 2-16-16
- Written Comments to Michigan DEQ, "Aquila Resources Back Forty Mining Permit Application and EIA, Project ID: 14A021" 2-16-16

No Demonstration that Mineral Rights are Secured

Additional concerns must be raised in the context of property's ownership. ***Has the applicant demonstrated their ownership of mineral rights on the Land Swap property? Aquila's 2016 Land Swap application (offering 755 acres in exchange for 290 at the mine site) did NOT include supporting documentation on the question of mineral rights:***

³⁷ *ibid.*

Please check one of the following ☒ EXCHANGE ☐ PURCHASE

DESIRED STATE-OWNED LAND

DNR Parcel ID Number	County	Township Name	Section(s)	Town	Range
Various	Menominee	Lake	12 and 6		

Description

1. T35N, R29W, Section 12, NE1/4 (167.7 acres)
2. T35N, R29W, Section 12, SE1/4 of NW1/4 (41.7 acres)
3. T35N, R28W, Section 6, NE1/4 of SW1/4 (41.4 acres)
4. T35N, R28W, Section 6, E1/2 of NE1/4 of SE1/4 (20 acres)
5. T35N, R28W, Section 6, E1/2 of SE1/4 of SE1/4 (20 acres)

Acres: 290.8

LAND OFFERED IN EXCHANGE (IF ANY)

County	Township Name	Section(s)	Town	Range
Menominee	Lake	2 and 3		

Description

T34N, R28W, Section 2 (275 acres of which ~ 150 acres subject to conservation easement - TBD)

- Government Lots 1, 2 and 3
- NE1/4 of NW1/4, NW1/4 of NE1/4, SW1/4 of NW1/4, SE1/4 of NW1/4, NW1/4 of SW1/4

T34N, R28W, Section 3 (450 acres)

- NW1/4 of NE1/4, SW1/4 of NW1/4, SE1/4 of NW1/4, SW1/4 of NE1/4, SE1/4 of NE1/4, NW1/4 of SW1/4, NE1/4 of SW1/4 of SE1/4, NE1/4 of SE1/4, SE1/4 of SW1/4
- SW1/4 of SE1/4, SE1/4 of SE1/4

Acres: 755

Minerals to be conveyed to the State? ☒ Yes ☐ No ☐ Other (Explain in Section E.)

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Despite a lack of supporting evidence, the applicant claims that wetlands located on the "Land Swap" site will be "preserved in perpetuity" as part of their Compensatory Mitigation plan. In order to claim "protection in perpetuity" an applicant must clearly demonstrate that all mineral claims on the property are properly extinguished. Aquila's claims to the minerals in Menominee County have previously been called into legal question. This is a significant test – and again, the burden of proof is on the applicant. It is essential that this question – mineral rights – be satisfactorily resolved before the applicant's Compensatory Mitigation Plan can be accepted. Otherwise, the same resource which threatens to destroy and impair wetlands at the Back Forty site today – underground minerals – may one day threaten wetlands at the proposed mitigation site.

Compensatory Mitigation Plans - Compliance Concerns

The Compensatory Mitigation Plan cannot be fully considered at this time, due to the applicant's failure to demonstrate that no feasible alternative exists, or that all wetland impacts have been minimized or avoided. There are numerous uncertainties about the claimed total impacts to wetlands at the mine site, which may be greatly underestimated in the application.

*We suggest, however, that the compensatory mitigation plan should include a clear, executable plan for monitoring, reporting requirements, research plans (for enhanced public benefit) and enforceable compliance plans. According to a recent study of DEQ wetland mitigation projects approved in the Upper Peninsula of Michigan, there is an unacceptably high rate of noncompliance. "In most states, federal wetland laws are overseen by the U.S. Army Corps of Engineers, but Michigan administers these laws through the state's Department of Environmental Quality (MDEQ). Our research provides insight into the effectiveness of the state's implementation of these laws. We examined wetland mitigation permit files issued in Michigan's Upper Peninsula between 2003 and 2006 to assess compliance with key MDEQ policies. **Forty-six percent of files were out of compliance with monitoring report requirements, and forty-nine percent lacked required conservation easement documents. We also conducted site***

assessments of select compensatory wetland projects to determine compliance with MDEQ invasive plant species performance standards. Fifty-five percent were out of compliance.”³⁸

Wetlands at the Mitigation Site are Not Threatened

The applicant controls the property that contains the proposed mitigation site through its broker, Northern Michigan Land Brokers (NMLB) . They claim that they intend to preserve the wetlands in perpetuity and that these wetlands are threatened by “development”, but these claims are unsupported.

Proposed Method of Compensatory Mitigation is the Least Desirable Method

“Aquila proposes to preserve 292 acres of wetlands located southeast of the Project area.” The applicant identifies the proposed mitigation site as approximately 5 miles from the mine site. Due to the meandering path of the Menominee River, however, the applicant’s proposed compensatory mitigation site is actually located approximately 20 river miles downstream from the mine site.

The Compensatory Mitigation Plan cannot be given serious consideration at this time, for the following reasons:

- First, the applicant failed to demonstrate that their wetland impacts are unavoidable. Our review of the LEDPA revealed serious flaws in their analysis of feasible alternatives, missing data, and an overall misunderstanding of the LEDPA requirement. The applicant bears the burden of proof, but failed to demonstrate that their selected design *is* the LEDPA. **Wetland permits may not be granted where there are feasible and prudent alternatives to wetland impacts.** The applicant failed to avoid and minimize their direct and indirect impacts on the aquatic ecosystem.
- Second, our analysis of the permit, and technical reviews of hydrology, groundwater modeling and assumptions related to the facility design strongly suggest that the total indirect impacts may be greatly underestimated. If this is shown to be true, the proposed mitigation plan will be vastly inadequate given the 20:1 preservation ratio. At present, the applicant’s proposal barely meets the minimum preservation ratio.
- For their compensatory mitigation proposal, Aquila selected “wetland preservation” although both Michigan and federal regulations view “wetland preservation” as the least desirable type of mitigation. “Wetland preservation” can *only* be accepted in cases where the applicant can demonstrate that the proposed wetlands are of “*exceptional quality*” – not true in this case – “*or in situations where the wetlands that would be preserved are under imminent threat, such as development, or threats outside of the applicant’s control*” – also not true in this case. The applicant controls this property, and has proposed swapping the land with the State of Michigan.
- Is the land threatened by the applicant? By the proposed land swap? Surrounding properties along the river appear sparsely developed. The property contains riparian wetlands subject to flooding – so the property cannot be under a significant development threat, as must be demonstrated.
- The Menominee River frontage in the area surrounding the proposed mitigation site shows little evidence of recent development activity. The applicant failed to demonstrate either that these are wetlands of exceptional quality OR that these wetlands are currently under threat by forces “outside of the applicant’s control.” Any threats would appear to be entirely in the applicant’s control.
- According to Michigan’s Administrative Code: “The preservation of existing wetlands may be considered as mitigation **ONLY** if the department determines that **ALL** of the following conditions are met: (i) The wetlands to be preserved perform exceptional physical or biological functions that are essential to the preservation of the natural resources of the state or the preserved wetlands are an ecological type that is rare or endangered. (ii) The wetlands to be preserved are under a

³⁸ “Compliance with Wetland Mitigation Standards in the Upper Peninsula” 29 Apr. 2012, <http://www.globalwatershed.mtu.edu/docs/fulltext.pdf>. Accessed 1 Feb. 2018.

demonstrable threat of loss or substantial degradation due to human activities that are not under the control of the applicant and that are not otherwise restricted by state law. (iii) The preservation of the wetlands as mitigation will ensure the permanent protection of the wetlands that would otherwise be lost or substantially degraded.” Aquila’s compensatory wetland mitigation plan fails to meet the criteria on all of these points.

Applicant’s Mitigation Ratio results in a Net Loss of Wetlands

“In focusing the goal on no overall net loss to wetlands only, EPA and Army have explicitly recognized the special significance of the nation’s wetlands resources.(...) Additionally for wetlands... mitigation should provide, at a minimum, one for one functional replacement (i.e., no net loss of values)”³⁹

How has the applicant evaluated the functional replacement “cost” for wetlands at the mine site containing threatened species? What value, if any, is assigned to the wetlands that extend off-site and feed larger wetlands complexes, supporting the adjacent Shakey Lakes ERA (oak savanna and pine barrens)? The applicant failed to assign any “scenic” value to wetlands in a “scenic corridor” SCA. The applicant failed to assign any “cultural value” to wetlands located in an archaeologically rich landscape, containing ancient garden beds, burial mounds, ceremonial dance rings, and more – a landscape of great cultural importance to the Menominee Indian Tribe of Wisconsin. What is the NET LOSS OF VALUES?

Compensatory wetland mitigation cannot be considered until the applicant demonstrates there is NO feasible alternative. The impacts to aquatic resources within the project area are **significant**. The applicant fails to acknowledge the presence of any feasible alternatives (such as milling ore at an upland property within the 5 mile radius of the mine site, where the impact to wetlands would be minimal). We believe that the proposed industrial beneficiation activity could be accomplished at another location, for example, with significantly fewer aquatic impacts. Additionally:

- **Applicant proposes total impacts to wetlands of 28.4 acres.** Independent reviews of hydrological and indirect impacts, however, suggest the applicant has greatly underestimated the Indirect Impacts to Regulated Wetlands. It should be noted that non-regulated (vernal) wetlands at the site are not included in the total loss calculations.
- Greater effort must be taken to avoid and minimize impacts before any compensatory wetland mitigation plan is seriously considered.
- The applicant’s proposed mitigation would not sufficiently compensate for impacts. Mitigation plan proposes the preservation of wetlands of **different ecological types (than the wetlands being lost)**. Forested wetlands such as those found at the Back Forty site are especially difficult to replace or restore, and take decades or centuries to develop, and some of the site includes critical habitat. Vernal wetlands that would be lost at the Back Forty site are not considered in the mitigation proposal.
- The Clean Water Act sets forth a goal of “no net loss”: the applicant must “avoid adverse impacts and offset unavoidable adverse impacts to existing aquatic resources, and for wetlands, strive to **achieve a goal of no overall net loss of values and functions.**”
- “A key goal of wetland mitigation is to avoid a net loss of wetlands, the so-called no-net-loss criterion (Sapp, 1994). In economic terms, no net loss may be interpreted as no net loss of wetland services and no net loss of wetland values.”⁴⁰
- In this case, mitigation proposals cannot compensate. The Back Forty or “mine site” wetlands should instead be called the Menominee-Sixty-Islands-Shakey wetlands, as they must be viewed as an integral part of a priceless and unique ecological and cultural landscape – part of a nationally unique site containing the northernmost example of mound-building and agricultural

³⁹ “MEMORANDUM OF AGREEMENT | §404 of the Clean ... - EPA.” 13 Dec. 2017, <https://www.epa.gov/cwa-404/memorandum-agreement>. Accessed 2 Feb. 2018.

⁴⁰ Steiner, P. H. (2003). “Compensating for wetland loss: a case study of michigan riparian wetlands.” Unpublished manuscript. Michigan State University, Lansing, Michigan.

“garden beds” dating to 1,000 years ago. These wetlands inhabit a sacred landscape, the source of the Menominee Indian people.

Under the Michigan DEQ Wetlands Mitigation Ratio (described below) that would require a minimum of 284 acres of wetland preservation. Aquila mitigation proposes to preserve only 294.24 acres, which barely meets the minimum ratio, and does not account for differences in wetland type. According to Michigan DEQ Wetlands Mitigation Ratios,⁴¹ “The permittee must provide wetland mitigation to assure that, upon completion, there will be no net loss of wetlands. **Wetland mitigation must be of a similar ecological type** as the impacted wetland wherever feasible and practical.”

“The Department of Environmental Quality is authorized to make minor adjustments in the standardized mitigation ratios. The ratios may be adjusted by as much as 20% to account for site-specific factors such as special hydrological features. **An additional adjustment, not limited to 20%, may also be made for differences in the type of wetland destroyed and the type created or restored.**”

Under Part 303, “Proper valuation of a wetland requires looking at its specific ecological features and services. The variation in features and services among wetlands means equally sized wetlands should vary in value. As a result measuring wetland net loss solely in terms of acreage may not account for real variation in value. **If replacement wetlands provide fewer services than the destroyed or damaged wetland, a net loss of value occurs even with a net gain in acreage.**”⁴²

What is the “net value” of the wetlands that will be lost or impaired at the mine site? Clearly, they must be seen not only as wet spots in an ecological landscape, but as integral threads in the intact cultural landscape, with traditional values related to the life and history of the Menominee people.

Yet all of the MiRAM evaluations for wetlands at the Back Forty sit were rated “0” for cultural values. This underscores a fundamental misunderstanding in the evaluation process. As cultural resources, these wetlands are irreplaceable, with Which wetlands *would* be considered culturally important?

Applicant Fails to Meet “Zero Loss” Goal of Wetland Protection

Under this permit, wetlands are destroyed at the mine site. The federal government recognizes that “the Clean Water Act and the Guidelines set forth a goal of restoring and maintaining existing aquatic resources. The Corps will strive to avoid adverse impacts and offset unavoidable adverse impacts to existing aquatic resources, and for wetlands, will strive to achieve a goal of no overall net loss of values and functions. In focusing the goal on no overall net loss to wetlands only, EPA and Army have explicitly recognized the special significance of the nation's wetlands resources.”⁴³

Applicant Proposes To Preserve Riparian Floodplain Wetlands

According to DEQ, the “*wetland mitigation must be of a similar ecological type as the impacted wetland wherever feasible and practical.*”⁴⁴

Proposed “Wetland Loss” and “Mitigation” Sites are in Different Subwatersheds

“Wetland Mitigation” site is located far from where the proposed wetland degradations and losses will occur. Wetland losses will impact the Menominee Watershed (HUC 04030108) and the Shakey River

⁴¹ “DEQ - Wetland Mitigation - State of Michigan.” http://www.michigan.gov/deq/0,4561,7-135-3313_3687-86447--,00.html. Accessed 7 Jan. 2018.

⁴² Steiner, P. H. (2003). “Compensating for wetland loss: a case study of michigan riparian wetlands.” Unpublished manuscript. Michigan State University, Lansing, Michigan.

⁴³ <https://www.epa.gov/cwa-404/memorandum-agreement>

⁴⁴ “DEQ - Wetland Mitigation - State of Michigan.” http://www.michigan.gov/deq/0,4561,7-135-3313_3687-86447--,00.html. Accessed 7 Jan. 2018.

Subwatershed (HUC 040301080901-01); wetland losses would take place in T35N, R28W, Sections 6, 7, and 12, and T35N, R29W, Sections 1, 11 and 12, Lake Township, Menominee County, Michigan, while the proposed wetland preservation would take place in T34N, R28W, Sections 2 and 3. The applicant states that the mitigation will take place “5.6 miles southeast of the Project area” but number is “as a crow flies” – not an aquatic measurement. As water flows, the distance between sites is considerably greater. **Due to the meandering path of the Menominee River, the applicant’s proposed mitigation site is located approximately 20.25 river miles downstream.**

It is interesting to note that the applicant previously claimed (in their NPDES review of feasible alternatives), that off-site water treatment at the Stephenson municipal water treatment plant, 10 miles away, was **not a feasible alternative**, because treated water would need to be discharged to a different watershed: “The Back Forty is located in Lake Township, Menominee County, and there are no available sewerage systems or municipal wastewater treatment systems in the vicinity of the Project. The closest municipal wastewater treatment system is located in the town of Stephenson, Michigan, 16 km to the east. Conveyance of water to Stephenson would be cost prohibitive due to the long distance and need to actively pump the water to overcome elevation differences. Additionally, the Stephenson treatment facility discharges into a different watershed than the Project.”⁴⁵

In fact, the applicant was wrong – discharges from a WWTP in Stephenson would have taken place in the Menominee River subwatershed. The Stephenson Waste Water Plant is located on the Little Cedar, which discharges into the Menominee just below the applicant’s proposed mitigation site. If there was any merit to the applicant’s earlier argument – *that an activity impacting a lower section of the Menominee River watershed invalidates a feasible option* – the concern has mysteriously been resolved in their Compensatory Mitigation plan.

§ Comments on the Permit’s Appendices

The Appendices are found in Volumes VI, VII and VIII:

Appendix A1: [6 R-Wetland Permit Application Nov 2017 reduced App A1 rev Dec 2017.pdf](#)

Appendix A2: [7 R-Wetland Permit Application Nov 2017 reduced App A2 \(1\).pdf](#)

Appendix B: [8 R-Wetland Permit Application Nov 2017 reduced App B.pdf](#)

Appendix A - Wetland Piezometer Installation Logs

For Piezometer 14, which was “drilled without sampling” to a depth of _____, the log note states “See SB-14A.” Is the applicant referring to the Piezometer 14A? Soil Boring sites are numbered SB-1 through SB-12. The Piezometer logs are

Appendix A1 - Water Balance Model

Applicant states that “The water balance model was run on a monthly basis for a total of two years under existing, operating, and closure conditions.” Clarify was is meant by “two years under existing” conditions? Are the “existing conditions” limited to wetland hydrological data from monitoring data collected in summer of 2017 only?

Clarify comment “5.2.1 Wetlands Modeled The model was run for the following 14 wetlands or wetland sub-divisions” – did the water balance model determine that 5 of the 14 wetlands (summary listed below) were “not influenced by regional groundwater elevations” or did that determination (“upland” versus “valley-bottom”) actually precede the water balance modeling?

Wetland B3 (upland wetland, *not influenced by regional groundwater elevations*)

Wetland B1c (upland wetland, *not influenced by regional groundwater elevations*)

Wetland B1 (upland wetland, *not influenced by regional groundwater elevations*)

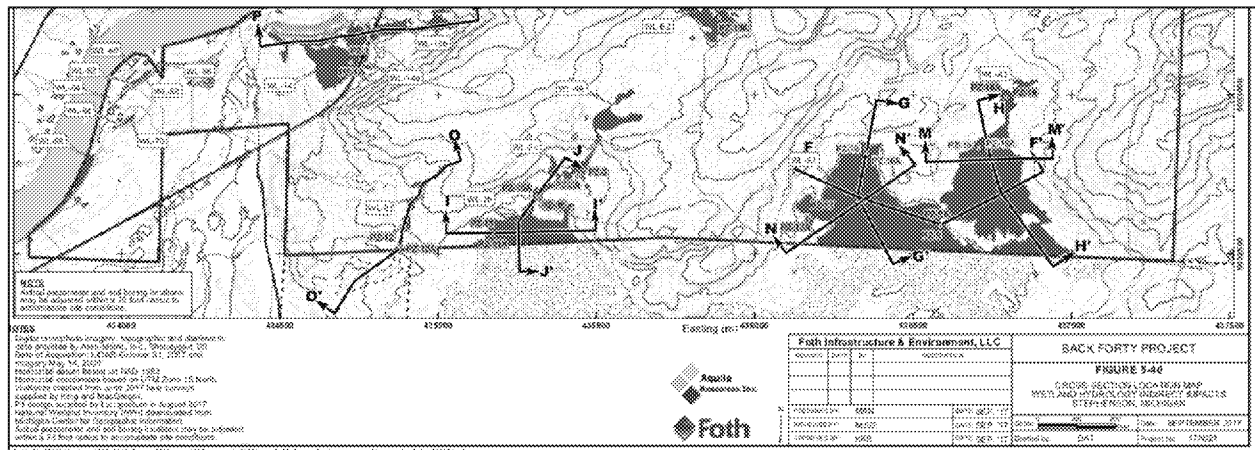
⁴⁵ Back Forty Antidegradation Demonstration, NPDES Permit Application, page 4.

Wetland 14/14a/15b (upland wetland, *not influenced by regional groundwater elevations*)
 Wetland 40/41 (upland wetland, *not influenced by regional groundwater elevations*)
 Wetland C1 Complex (valley-bottom wetland, influenced by regional groundwater elevations)
 Wetland C1 Lobe (valley-bottom wetland, influenced by regional groundwater elevations)
 Wetland C1 Property (valley-bottom wetland, influenced by regional groundwater elevations)
 Wetland 2b/A1/A3 (valley-bottom wetland, influenced by regional groundwater elevations)
 Wetland 2b Lobe (valley-bottom wetland, influenced by regional groundwater elevations)
 Wetland A1 West-North Lobe (valley-bottom wetland, influenced by regional groundwater elevations)
 Wetland A1 East-North Lobe (valley-bottom wetland, influenced by regional groundwater elevations)
 Wetland A1 Property (valley-bottom wetland, influenced by regional groundwater elevations)
 Wetland 6 (valley-bottom wetland, influenced by regional groundwater elevations)

*Explain how the “wetland impacts” finding is different if the water balance model is run differently, for example, assuming that **connected parts of larger wetlands** are identified using the SAME type (either “upland” or “valley-bottom” but not both). For example, the applicant states “Wetlands C1 Lobe, C1 Property, and 40/41 are all part of Wetland C1 Complex, along with a large off-site wetland to the north.” Yet the applicant claims that Wetland 40/41 is “upland” while C1 is “valley-bottom”. The claim that two lobes of the same wetland would be different types of wetlands is not credible.*

According to guidance from the State of Michigan, “A water budget should be calculated for a range of conditions. **Data from a year with an average amount of precipitation is used to describe long-term effects, but it may be necessary to evaluate ‘wet’ and ‘dry’ years for projects with sensitive, natural resources.** The most difficult part of computing the water budget is locating data that allows you to accurately estimate the net surplus or deficit. If the project depends primarily on surface runoff, you can **identify years with normal, below normal, and above normal rainfall and use that information to determine the surface runoff under those three climate conditions.** Rainfall data are readily available from the National Oceanic and Atmospheric Administration (NOAA) and other agencies. However, if the project area depends on groundwater flow, then you should ideally use groundwater flow data for a range of conditions. But groundwater flow data, if they exist at all, are usually only available for the time period when a permit application is being reviewed. “

Wetland Hydrology Indirect Impacts (Figure 5-40, Cross-Section Location Map)



Determine whether wetlands WL-A1, WL-A3, WL-2b, WL-2c, and WL-4A (which extend offsite, to the south of the Project Boundary) are connected to the Shakey Lakes Savanna ecosystem.

The Michigan DNR describes this area as follows “**Importance: Shakey Lakes contains the largest area of pine and oak barrens in northern Michigan. Five distinctly different savanna ecosystems are found at the site along with five state threatened or special concern species.** Historians believe that native peoples purposely set fires on a regular basis to improve game habitat and blueberry crops. These fires, along with lightning strikes, maintained a savanna-type landscape. Following nearly 100

years of fire suppression, savanna restoration activities, including the use of prescribed burns, have begun at Shakey Lakes”

Wetland “Evapotranspiration Rate”

According to the EPA’s Methods for Evaluating Wetland Condition - Wetland Hydrology⁴⁶, the wetland sites identified as “Upland Wetlands” are more sensitive to climate shifts. “Water levels in wetlands that are dependent on atmospheric exchanges tend to be **more affected by climatic signals than wetlands dependent on groundwater sources** (Orme 1980). Lakes, like wetlands, tend to integrate climatic signals over time because of the longer residence time in these systems.”

The evapotranspiration rate is key to the applicant’s predictions of “no impact” on off-site wetlands. Applicant states: “Equations 2 and 3 indicate that **wetland soils will maintain existing levels of saturation as long as infiltration from the ground surface equals the sum of evapotranspiration losses and net seepage outflow to the surrounding groundwater system**. In a case where GWout(net) plus evapotranspiration is negative, there is a net flow of water from surrounding groundwater to the wetland soils; in such a case, infiltration is negative and represents seepage from wetland soils to the ground surface.” **Applicant uses a wetland evapotranspiration rate of 18” per year** (“The USGS study estimated an average evapotranspiration rate of 18 inches per year and a recharge rate of 7 inches per year”), citing a 1976 USGS study of the Menominee River Watershed. **According to USDA data for Menominee County, however, the evapotranspiration rate for Menominee County is actually 20” per year.**⁴⁷ The applicant’s use of an 18” evapotranspiration rate would keep more water in the system than really exists. The applicant also considers “Applying the Blaney Criddle method to the Project location using monthly average temperatures from the Stephenson, Michigan NOAA weather station yields annual evapotranspiration estimates ranging from 22 inches per year to nearly 34 inches per year, depending on vegetation type. The lower estimate corresponds to wooded ground cover, whereas the higher estimate corresponds to irrigated alfalfa. Input parameters for wetland vegetation do not exist for this method, so the alfalfa parameters were used to represent an upper limit for high consumptive use vegetation that can be regarded as representing high-transpiring wetland plants. (...) The 34-inch evapotranspiration depth was then distributed over the months of May – October per the open water evaporation distribution found in the Michigan Land and Water Management Division General Guidelines for Calculating a Water Budget (MLWMD, 2010). Note that the evapotranspiration rate was not set as a function of water level depth; rather, the rate was set according to the magnitude and monthly distribution discussed above, regardless of the water level position relative to the rooting depth.”⁴⁸ *Unclear – explain how the difference between the USGS, USDA and Blaney Criddle evapotranspiration rates impact the applicant’s modeling? Is the true wetland evapotranspiration rate unknown?*

Applicant states that wetland water balances are calculated as follows: “4. Compute or determine the evapotranspiration from the wetland on a monthly basis. 5. Compute the monthly net flux of water from saturated wetland soils to the groundwater system (**using the MODFLOW model for valley-bottom wetlands or a one-dimensional Darcy model for wetlands in upland setting**). 6. Determine the total monthly flux from the saturated wetland soils by summing evapotranspiration and net outflow to groundwater.”

If the higher evapotranspiration rate is used, how is the Water Balance impacted (“total monthly flux from the saturated wetland soils”)?⁴⁹ How is the difference accounted for? Does the evapotranspiration calculation consider planned changes to the mine site vegetation (currently: evapotranspiration of vegetation-covered landscape; significant portions of each watershed will shift to bare soils and facility-covered areas)? Is the USGS figure based on estimation or measurement? Explain whether the

⁴⁶ https://www.epa.gov/sites/production/files/documents/wetlands_20hydrology.pdf

⁴⁷ “Monthly Evaporation by County for Michigan (inches ... - NRCS - USDA.”

https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs141p2_024175.pdf. Accessed 15 Jan. 2018.

⁴⁸ Appendix A, *6 R-Wetland Permit Application Nov 2017 reduced App A1 rev Dec 2017.pdf* page 25.

⁴⁹ Appendix A1, *6 R-Wetland Permit Application Nov 2017 reduced App A1 rev Dec 2017.pdf* page 21.

selection of two different modeling methods (“using the MODFLOW model for valley-bottom wetlands or a one-dimensional Darcy model for wetlands in upland setting”) impacted the applicant’s conclusions about the hydraulic connectivity of “upland wetlands”?

Wetland Water Balance Data does not use On-Site Data

“While regional precipitation networks can be used to estimate site conditions, the large spatial heterogeneity of precipitation patterns generally means that on-site **precipitation measurements (either conventional or recording rain gages)** are needed when trying to obtain information for water balance analysis.”⁵⁰

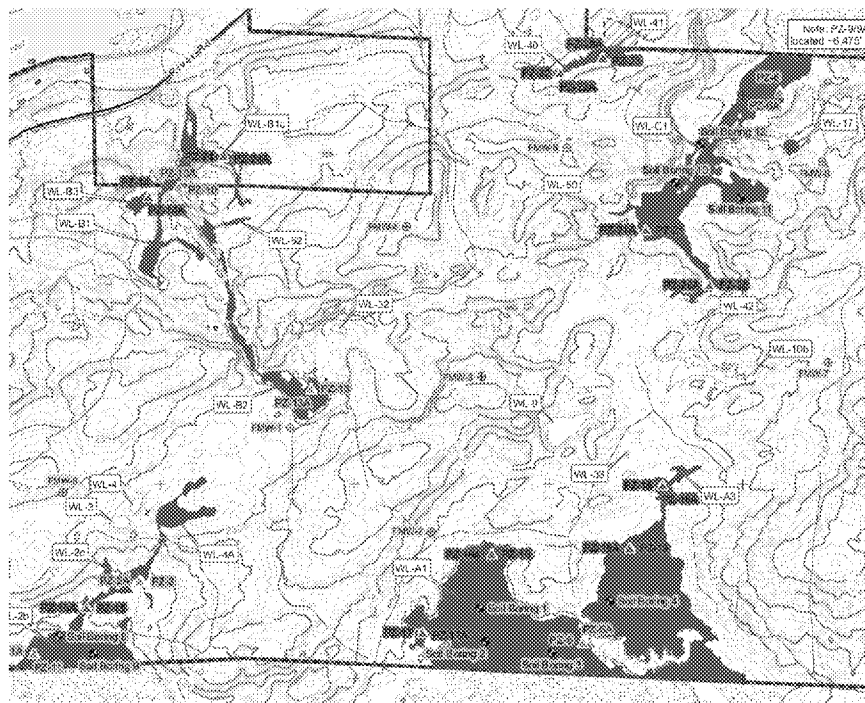
Wetland Conclusions are Based on Limited Soil Borings

It is immediately evident, reviewing the map , that very few sites were selected for SOIL BORINGS, and these borings were all shallow. The Soil Boring locations are summarized in a table found in Appendix A2:

Soil Boring	North	East	Ground Elevation
Soil Boring 1	5032681.69	436323.20	736.18
Soil Boring 2	5032595.97	436338.81	736.04
Soil Boring 3	5032568.11	436509.11	735.61
Soil Boring 4	5032703.34	436656.92	737.49
Soil Boring 8	5032609.38	435239.88	725.15
Soil Boring 9	5032565.13	435330.81	725.46
Soil Boring 10	5033777.50	436826.61	737.53
Soil Boring 11	5033743.56	436994.17	738.60
Soil Boring 12	5033875.50	436891.65	737.09

Several of the wetlands have only PIEZOMETER BORINGS (also very shallow) to support their hydrological interpretation, while other wetlands have both piezometer and soil borings. Why is the difference in wetland data collection methods not clarified or justified by the applicant?

The map showing “Soil Boring” locations is identified as “Figure 3, Project Area Location Map Showing Regulated and Non-Regulated Wetlands, Response to Regulatory Comments.”⁵¹



⁵⁰ https://www.epa.gov/sites/production/files/documents/wetlands_20hydrology.pdf

⁵¹ Appendix A2, Figure : 7 R-Wetland Permit Application Nov. 2017 reduced App A2 (1).pdf page 258.

Applicant Uses Shallow Soil Borings to Claim “Upland Wetlands” Have No Hydrological Connection to Groundwater

The application provides scant evidence to support their conclusion that certain wetlands, identified as “Upland Wetlands”, are perched above the water table with no hydrological connection with groundwater.

To support their claims, the applicant included only NINE Soil Boring logs. **All of these soil borings are extremely shallow, ranging in depth from only 4.0’ to 6.0’ feet.** Only one log notes “rock” encountered at the lower extent of the sample; almost all of the boring logs end with descriptions of “silty sand”. **All Soil Boring logs show wetland soils that are “wet” from the top to the bottom.** SB-10, for example, is described as: *“(SP/SM) SILTY SAND, 10YR 5/4, fine to medium, with coarse sand, with fine to coarse gravel, medium dense, no plasticity, saturated, 2% mottles 2.5YR 4/3, 1% mottles 2.5Y 7/8. Auger Drilling Refusal and End of Boring (at 4.0’). Driller’s note: Driller’s note: Samples wet 0.0’ to 4.0’⁵²”*

The Piezometer Logs are similar, with PZ-14A is described as: *“CLAYEY SAND, 2.5Y 4/3, fine, with coarse and fine gravel, with coarse sand, saturated, high plasticity, loose. 5.5’ Auger Drilling Refusal and End of Boring (at 5.5’). Driller’s note: Samples wet 0.15’ to 5.5’⁵³”*

Why does the applicant conclude that the bottom of the wetland was reached? Both Piezometer and Soil Borings were done using “HAND AUGER” – not a mechanical auger. Hand-augering stopped at “resistance.” Best practices dictate that soil borings must be done in order to demonstrate a site’s “infiltration capacity characteristics” or to “determine the depth to groundwater and bedrock.” The applicant asserts that the groundwater level is deeper than the bottom of the soil borings, in all cases, but none of these soil borings extended deep enough to “determine the depth to groundwater” or otherwise demonstrate that bedrock had been reached. All boreholes ended in silty sand; none of these shallow boreholes reached the level of the water table.

Lack of Hydrogeological Visualization

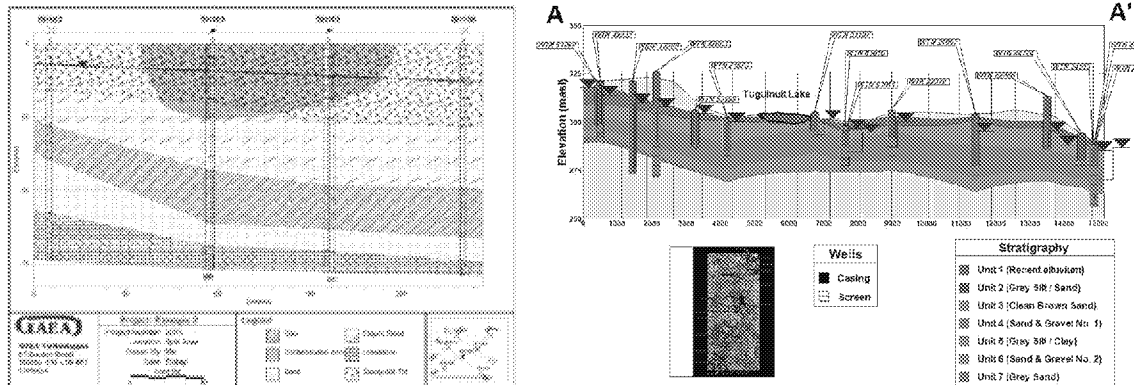
Despite a lack of physical evidence, the applicant concludes that the bottoms of wetlands are resting on “confining layers” or impermeable aquitards. None of the sites included as “Soil Borings” recovered samples of the bottom conditions, however. **None of the Soil Borings drilled through a clay lens or demonstrated an impermeable bottom layer. Physical evidence does not support the applicant’s conclusions about “Upland Wetlands.”** For the applicant to reach defensible conclusions about wetlands, Soil Boring Logs would need significantly more detail and interpretation.

No Fence Diagrams

A Fence Diagram should have been included, illustrating the underlying hydrogeology of each wetland. There is no three-dimensional cross section or geological visualization, supporting a claim of “Upland Wetlands” disconnected from groundwater by unsaturated soil. In fact, the application may not contain enough soil boring data to produce such a cross-section. A typical Fence Diagram (examples shown below) would require data from multiple wells and soil boring logs – closely spaced borings, perhaps only 5 or 10 feet apart – and soil boring data should extend all the way to the water table or aquifer. Why didn’t this applicant include such a visualization?

⁵² Appendix A2, Boring Log for Soil Boring SB-10 : [7 R-Wetland Permit Application Nov 2017 reduced App A2 \(1\).pdf](#) page 31.

⁵³ Appendix A2, Boring Log for Piezometer PZ-14A : [7 R-Wetland Permit Application Nov 2017 reduced App A2 \(1\).pdf](#) page 4.



Gaps between soil borings and well sites should not be too large, since the subsequent hydrogeological cross-section would be subject to interpolation and misinterpretation. Presumably, if a confining layer or aquitard were present, it would be intersected by multiple borings throughout the grid, demonstrating how the wetland is contained by a consistent confining layer. None of the applicant's soil borings conclusively sampled such a barrier. Has the applicant demonstrated there is no lateral flow or interflow from these wetlands?

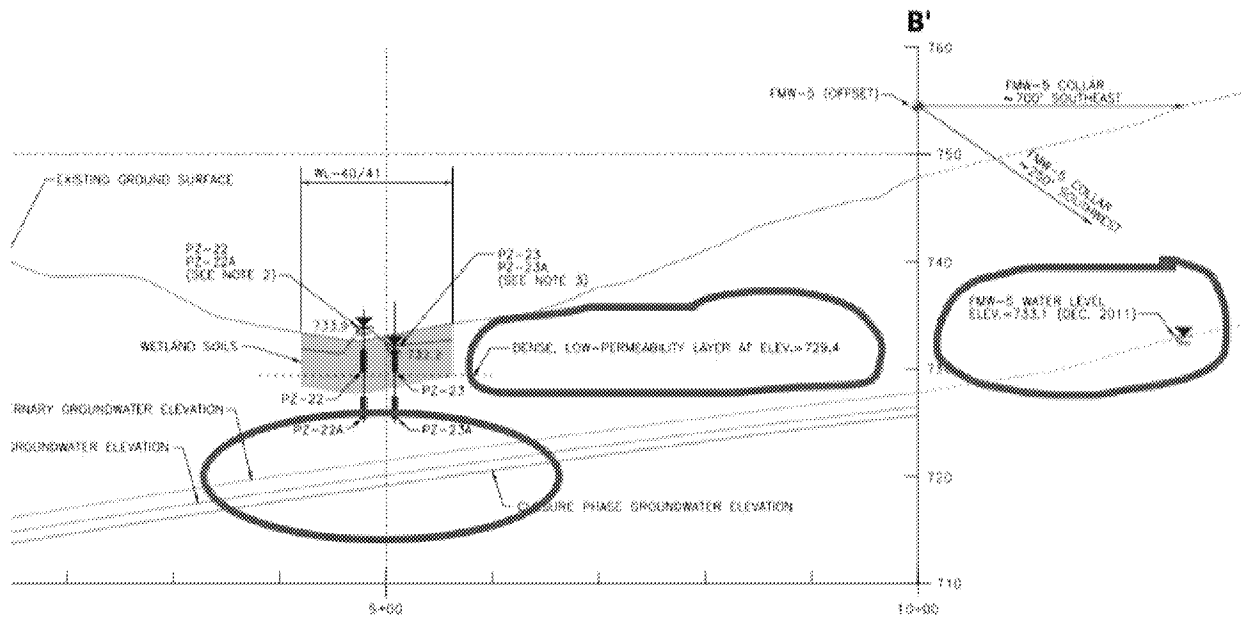
The applicant's conclusion are based on too little information, and speculations about the water table using widely-spaced monitoring wells. Shallow soil boring is not adequate for vertical characterization or claims of "perched" wetlands. Standard guidance for Soil Boring ("borings to approximately 35 feet should be performed to identify the underlying strata") was not followed.⁵⁴

Since hand-augered soil boring logs stop at only 4-6', noting "resistance" or "auger refused", the applicant did not bore deeper, did not reach the "water table" and did not sample the inferred confining layer. Soil borings are routinely completed to a depth of 20-45'; boring protocols generally recommend that, at the point of *auger refusal* (bedrock or aquitard encountered), that further boring should be completed using air rotary drilling, drilled at least 5 feet further. *Did the applicant follow recommended guidelines for soil boring? How does Michigan define the "confining layer"? Is there a minimum depth that must be demonstrated (physical drilling evidence)?*

In addition, the groundwater data may be out of date. The applicant cites monitoring well data from FMW-05, located more than 700' from Wetland WL-40/41 – with water table data from December 2011. *Have groundwater elevations not been collected from this well since 2011?*

By contrast, all wetland water table measurements were collected between July and early October of 2017 - less than the baseline required. There is a potential seasonal variation here, not accounted for by the applicant.

⁵⁴ The Effects of Wastewater Treatment Facilities on Wetlands in the Midwest



Groundwater Elevation Data May Represent Drought Years

Groundwater elevations and other hydrological data collection, gathered in support of the Part 632 Environmental Impact Assessment (EIA), cited in the preparation of this Wetland Permit application, took place during a number of drought years, roughly 2007-2011. *Is the underlying data understood to be accurate – or is the applicant underestimating water levels in groundwater? See diagram above, which mixes water table data from 2011 with wetland water elevation data from 2017. Drought mapping info from NOAA confirms that this part of the U.P. remained in drought throughout the EIA preparation years.*

Missing Soil Boring Log Data

Reviewing the Piezometer Installation Logs and Wetland Maps, there is an unexplained gap in the Soil Boring data. *Why is no information supplied regarding Soil Borings SB-5, SB-6, and SB-7? Where were these soil boring sites located? It appears that data pertaining to these sites has been removed from the Wetland Permit Application.*

Too Few Soil Boring Sites

Soil boring sites are too few and set too far apart to substantiate the conclusions about hydrological connection – several hundred feet apart. In general, in order to substantiate claims related to subsurface hydrogeology, a minimum of four soil borings are needed. *Why did the applicant select so few sites for soil boring? By contrast, Wetland WL-A2 contains only one soil boring site. Wetland WL-2B contains only two soil boring sites. In Wetland WL-A1 there are three soil borings, but **sites SB-1 and SB-3 are approximately 800 feet apart!** Several of the Back Forty's wetland complexes have piezometers, but no soil boring sites.*

Seepage to Groundwater ("Darcy's Law") is Inferred, Not Demonstrated

Since the goal of soil borehole drilling was to confirm the presence of hydric soils in the wetlands, and to identify the presence (or absence) of hydrogeological barriers or connections, alternative drilling methods should have been used (such as Machine Auger, or Direct Push Technology). Because all of the wetland soil boring sites (sampled using "Hand Auger") encountered "auger refusal" prior to reaching the groundwater table, drilling should have proceeded following usual field drilling protocols, such as "offset approximately five feet from initial borehole, blind-drill (continuous drilling without soil sampling) to refusal

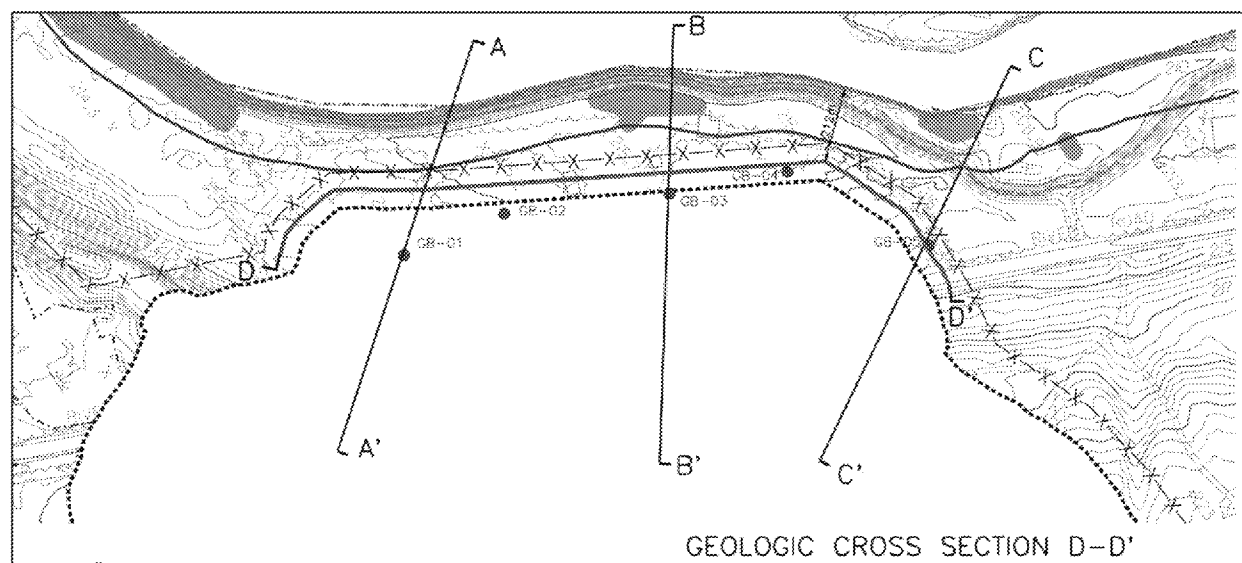
depth, and continue drilling/sampling from that point". Soil borings failed to reach groundwater table or sample the inferred "restrictive" layer. No physical samples support the applicant's conclusion.

Groundwater Drawdown Modeling

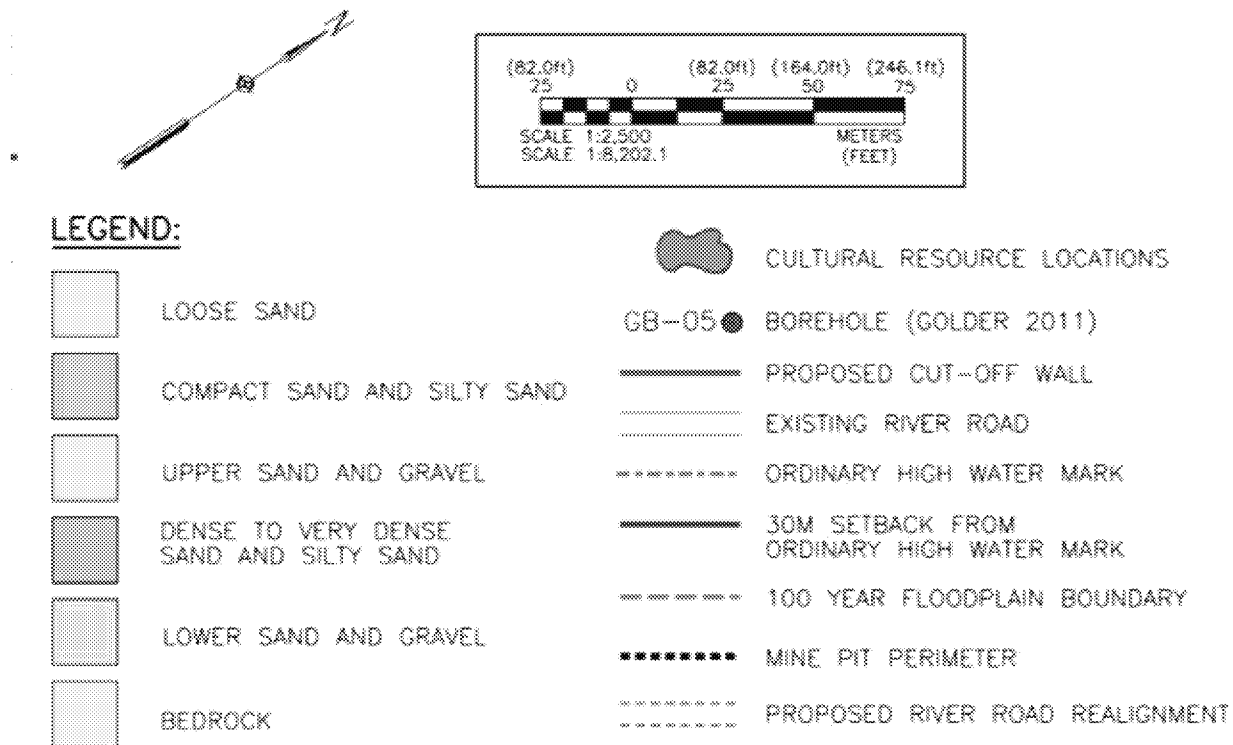
It is hard to understand how the applicant has limited the drawdown impacts in such a way that the drawdown does not cross the Project Boundary line. The applicant's explanations only further confuse the question: *"Comparisons of drawdown for this sensitivity run to those obtained from the calibrated model have not been made because there is no reference water table available to use as the starting point for a drawdown calculation, as the model for these parameter sets is out of calibration."*⁵⁵ The answer is unacceptable.

Appendix B - "River Road Realignment"

The applicant claims that the plan for River Road realignment (between pit cut-off wall and Menominee River) has been dropped "to limit impacts to wetlands" but Appendix B Figure 2 still references the planned realignment. Please clarify Figure 2: where is the "Proposed River Road Realignment"?



⁵⁵ Appendix A2: 7 R-Wetland Permit Application Nov. 2017 reduced App A2 (1).pdf page 238.



Clarify: it is unclear whether the "River Road Realignment" layer was deleted from the figure (and the legend is out of date), or whether the road layer was omitted (and the legend is correct)? Other maps in the same volume include the same reference to a missing River Road (pages 185, 381, and 382).

Appendix B - Lead and Freshwater Mussels

Lead levels at the outfall will exceed impact threshold for freshwater native mussels. See Mixing Zone Calculation: "A lead concentration of 10 µg/L is used because this is the threshold concentration above which adverse impacts to mussels may occur. Solution of Equation 1 will define the downstream location at which point lead concentrations adjacent to the bank will drop below 10 µg/L. The approximate annual mean discharge obtained from the U.S. Geological Survey (USGS) gaging station at White Rapids dam (see Attachment 1) is 2500 cfs. River depth, d , is set equal to 2.5 ft as an approximation of the average depth across the river. Actual river depth was surveyed by Environmental Resources Management (ERM) (2011) as ranging from zero ft at the banks to approximately 6 ft in the center of the channel. River width at the location of the outfall is approximately 334 ft (see outfall location figure in permit application). Channel slope determined from USGS topographic maps is approximately 0.00038 ft/ft. The flow velocity of 2.994 ft/s is determined as the discharge (2500 cfs) divided by the river wetted area (334 ft x 2.5 ft). Iteratively solving Equation 1 gives $X = 125$ ft. Thus, the maximum downstream distance at which lead concentrations are expected to equal or exceed 10 µg/L for lead is 125 ft below the downstream edge of the riprap pad conveying discharge to the river. Between the outfall and this location, lead concentrations are projected to exceed 10 µg/L close to the river bank. Downstream of a point 125 ft below the outfall, lead concentrations will be less than 10 µg/L."⁵⁶

Which mussel species is used, in this statement, to determine that mussels are able to tolerate lead up to the 10 µg/L "threshold concentration above which adverse impacts to mussels may occur." Specifically, what are the "adverse impacts" – mortality? Failure to reproduce? Are all of the Menominee River

⁵⁶ Permit file 8-R page 285-396

freshwater mussel species considered equally intolerant of lead? Will there be any biological monitoring of the mussels located 135 feet below the outfall, where presumably the lead concentrations will be less than 10µg/L? Will long term sediment monitoring for toxic metals (lead, zinc, mercury, copper) take place in the outfall and along the mixing zone?

Appendix B - Mussel Relocation Purpose – Toxic Discharge, or Sediment?

Has the purpose of the mussel relocation program changed, from (as originally proposed) mitigation for **impacts from sediment releases in the construction of the Outfall**, to (now) a relocation plan that would move the mussels away from toxic discharges? *“Michigan Department of Environmental Quality (MDEQ) has requested a mitigation plan to **protect mussels that could potentially be impacted as a result of treated water discharge from the outfall.**”*⁵⁷

- While this is a Joint Permit Application, the applicant's new plan to relocate mussels away from the "Mixing Zone" confuses the activities permitted by Part 301 (outfall, streams) and Part 303 (wetlands) with activities authorized under the NPDES Permit (toxic discharges to the Menominee River). *“The Michigan DEQ has directed to further minimize the impacts to freshwater mussels.”*
- Under that permit, despite our recommendation that strict and protective limits be set for numerous contaminants, the NPDES permit was issued without effluent limits for several parameters of concern, resulting in mass loading of “lead, nickel, copper, zinc and cadmium” from the NPDES discharge? This question seems critical, since the “draft permit would have authorized the additional daily loading of toxic metals to the Menominee River as follows: 7.6 POUNDS of lead, 15 POUNDS of nickel, 0.58 POUNDS of copper, 7 POUNDS of zinc and 0.27 POUNDS cadmium – in addition to many other contaminants of concern and numerous report-only values in lieu of strict limits.” (See our 2016 [comments on the NPDES Permit.](#))

In the Wetland permit, Stantec states: “As the project is currently proposed, direct effects to freshwater mussels may occur as a result of construction activity at either of the proposed outfall locations.” Clearly, if mussels are to be moved out of the MIXING ZONE, the impacts have been reexamined.

5.0 DISCUSSION

The survey areas at both the proposed outfall locations contain healthy mussel populations as well as state listed mussel species. Mussel densities were lower in the ADI of the 1st potential outfall location (88 mussels in Transects 2 and 3 compared to the ADI at the 2nd potential outfall location (127 mussels in Transects 2 and 3). Additionally no live state listed species were observed in the ADI of the 1st outfall, whereas three live *O. olivaria* and three live *P. sintoxia* were observed in the ADI of the 2nd outfall. The highest mussel density occurred at the 1st outfall in the downstream buffer transects where a large mussel bed is located. The lowest mussel densities occurred in the lateral buffer areas of the 1st outfall, and the downstream buffer transects of the second outfall.

As the project is currently proposed, direct effects to freshwater mussels may occur as a result of construction activity at either of the potential outfall locations. Due to the presence of state listed taxa, it is anticipated that a mussel rescue and relocation program will be necessary to minimize potential impacts to the resident mussel population.

We applaud the regulatory interest in protecting mussels from discharge impacts. But why was this revision not clearly stated in the application's public notice? Wasn't the mussel relocation program originally related to sediment releases under the Part 301 (outfall construction), rather than for mitigation of NPDES discharges? The scope of concern has shifted.

- *“Back Forty Project wetland permitting process, this memorandum (memo) summarizes the calculation of the aerial extent of a **mixing zone** in the Menominee River at the location of the*

wastewater treatment plant (WWTP) outfall. **The need to define the mixing zone is driven by mitigation planning associated with the prevention of impacts to mussels in the river.**

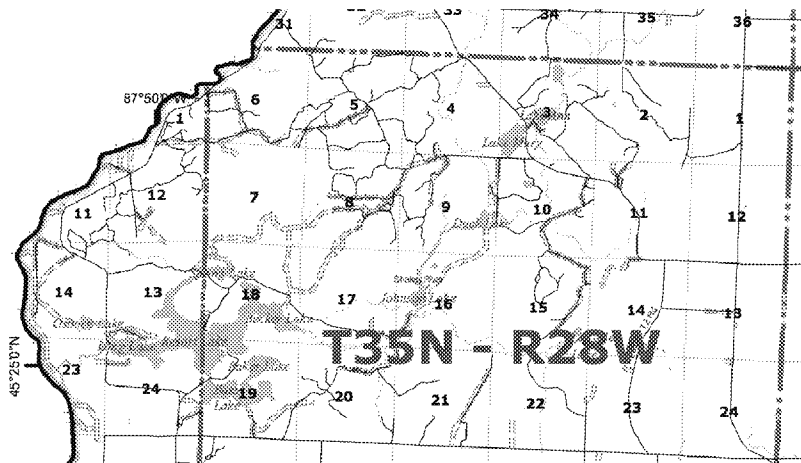
- While the mussel relocation plan (and revised protocol) is included in this Wetland (Joint Permit Application), the discharges were previously permitted under the NPDES. Shouldn't this significant reconsideration of the harms to freshwater mussels in the mixing zone be considered under a revision of the NPDES Permit? If the goal is to avoid and minimize the long-term harms to freshwater mussels from heavy metals and other contaminants, why are there NO DISCHARGE LIMITS for known aquatic toxics?
- Under the Clean Water Act, avoidance of harms could best be accomplished by strictly reducing the harmful release of effluent discharge, which may require a redesign of the Waste Water Treatment Plant. This remains unclear, however, and the applicant has requested extensions related to submission of their water treatment plan.
- As CSP2 previously noted, in 2016, "The water treatment plant design, including any necessary pre-treatment of wastewater prior to entering the plant, should be in place at this stage of permitting, but is not." As of now, the Waste Water Treatment Plant design is unknown.
- Avoiding harm through modification to WWTP design, to achieve strict limits on pollutants, is preferable to disrupting listed species from critical habitat. We request that the NPDES permit be reconsidered with these concerns in mind.

Appendix C - MiRAM Forms

See our MiRAM comments concerning §5 (above).

§ Public Notice Document

Point of confusion: the Public Notice document stated that the project is located at: "T35N, R28W, Section 04, Lake Township, Menominee County, Michigan" – but this appears to be incorrect. Section 04 is not located at the proposed Aquila Back Forty site. Section 04 is considerably east of the project boundary, where the applicant's "utility corridor" would meet up with the existing power grid? The mine site is not in Section 04. See plat book screenshot:



Additional Concerns

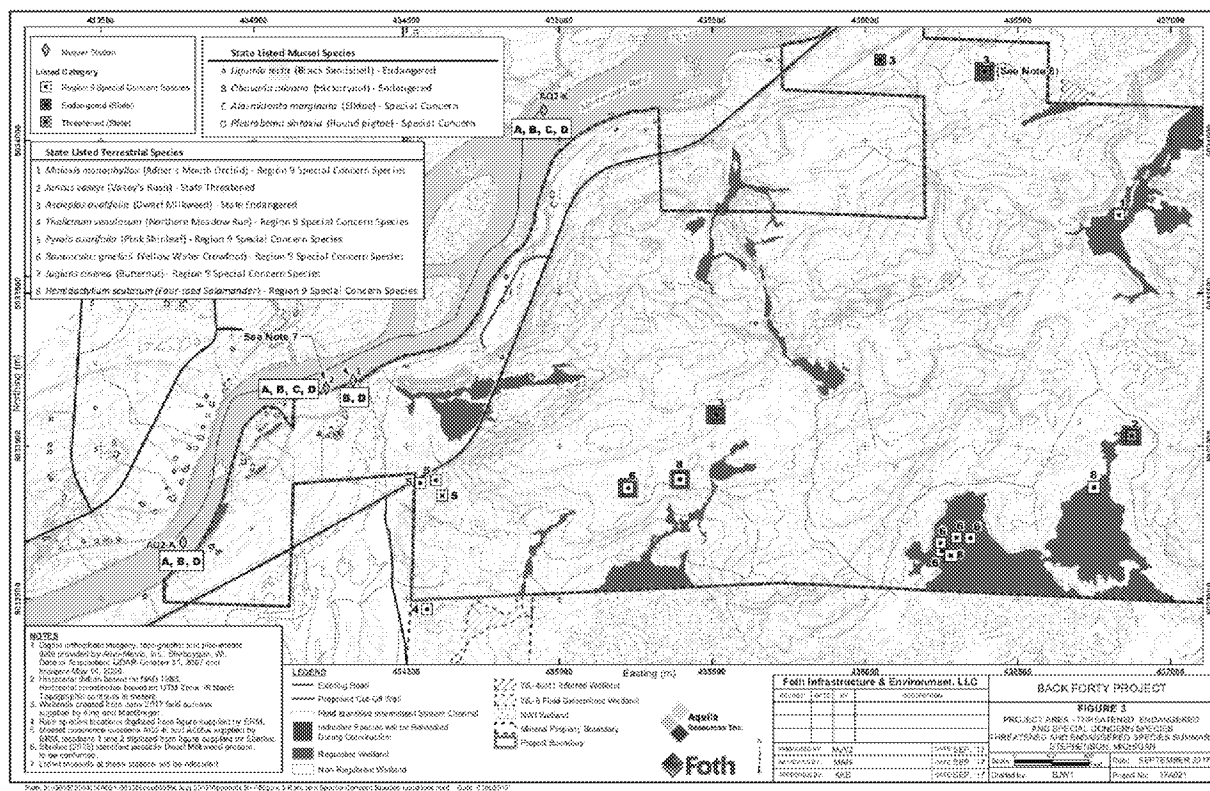
NPDES Outfall – Impacts of Construction

"The project also proposes the installation of a 15-inch diameter outfall pipe within the 100-year floodplain of the Menominee River and an associated 11 cubic yards of riprap water ward of the ordinary high water mark of the Menominee River for the purpose of erosion control."

It remains unclear why the proposed NPDES discharges need to be direct discharges to the Menominee River, rather than discharges to basins where settling, chemical correction (such as pH) or other treatment might improve the water quality. The construction of the outfall is an aquatic impact that could be avoided through an enlightened redesign of the WWTP.

The outfall is proposed for construction at the 100-year floodplain elevation. In order to minimize any potential impacts on fish spawning and migration in the Menominee River, we recommend that no construction of the Outfall should be permitted at the proposed location between the spring and fall seasons (roughly April 1 through May 15 and September 20 and October 31, unless more appropriate species-specific limitations are suggested by the USFWS); in order to explicitly limit disruptions from construction activities including operation of heavy equipment, installation of pipeline, riprap, apron, or release of sediments.

Mussel Relocation Plan and Outfall Construction Impact Threatened, Endangered, Special Concern and Other Species of Conservation Concern



The applicant's "Figure 3, "THREATENED, ENDANGERED, AND SPECIAL CONCERN SPECIES THREATENED AND ENDANGERED SPECIES SUMMARY" marks the locations of multiple "State Listed Mussel Species: A) *Ligumia recta* (Black Sandshell) - Endangered B) *Obovaria olivaria* (Hickorynut) - Endangered C) *Alasmodonta marginata* (Elktoe) - Special Concern D) *Pleurobema sintoxia* (Round pigtoe) - Special Concern"⁵⁸

The applicant failed to disclose, in Figure 3, locations of State Threatened species which were previously identified. The original EIA for this project⁵⁹ stated that, "Additionally, three live individuals of the State Species of Concern (*P. sintoxia*)⁶⁰ and one weathered shell of the State Threatened species Fawnsfoot (*Truncilla donaciformis*) were observed at the 2nd outfall location."⁶¹ These occurrences are not shown on Figure 3, nor included in the Table 1 list of "State Threatened, Endangered, Species of Special Concern, and Invasive Mussel Species Found in All Aquatic Survey Locations" (Vol. VIII page 390), as shown below:

Table 1
State Threatened, Endangered, Species of Special Concern, and Invasive Mussel Species Found in All Aquatic Survey Locations

Station	Location	<i>Ligumia recta</i>	<i>Obovaria olivaria</i>	<i>Alasmodonta marginata</i>	<i>Pleurobema sintoxia</i>	<i>Alasmodonta viridis</i>	<i>Dreissena polymorpha</i>
		Black Sandshell Endangered	Hickorynut Endangered	Elktoe Special Concern	Round Pigtoe Special Concern	Slippershell Threatened	Zebra Mussels Invasive
AQ1-K	River	x		x			x
AQ1-A	Menominee						
AQ2-K	Menominee	x	x	x	x		x
AQ2-A	Menominee	x	x	x	x		x
AQ1-E	Menominee	x		x	x		x
AQ1-B	Menominee	x	x				x
AQ4	Menominee	x					
1	Menominee		x		x		
2	Menominee	x	x		x		
AQ7	Baker/Bear Lake						
AQ8	Shakey River					x	
AQ9	Little Shakey Creek					x	
AQ10	Shakey River					x	

Truncilla donaciformis is also considered to be rare in Wisconsin, where it is listed as "Endangered".⁶² While no live specimens of this mussel were found during the original survey, the shell provides good evidence that it still exists in this stretch of the Menominee River and/or in local tributaries. This find also represents a range extension of over 100 miles for this mussel species, with the closest previously known occurrences in southeastern lower Michigan and southwestern Wisconsin.^{63 64} Despite being protected on both sides of the river, the applicant has failed to give further consideration to this rare mussel since the survey.

According to the "Proposed Study Plan for Freshwater Mussel Relocation Associated with Proposed Outfall" (September 2017 Stantec letter to Michigan DNR, page 272 Appendix B):

⁵⁸ Appendix B, page 395.

⁵⁹ DEQ-OOGM D 2015 22084 2015-11-12 Aquila Resources Mining Permit Application - Environmental Impact Assessment Volume III.pdf

⁶⁰ Round Pigtoe (*Pleurobema sintoxia*) and Fawnsfoot (*Truncilla donaciformis*); both are listed as "Species of Greatest Conservation Need" (Mussels, SGCN List) on Michigan's Wildlife Action Plan 2015-2025.

⁶¹ Stantec Consulting Services Inc. October 22, 2014. "Freshwater Mussel Survey for Proposed Outfall, Menominee River, Menominee County, Michigan. Appendix E-2 in Aquatic Biota Report Environmental Baseline Studies. Aquila Resources Inc. Back Forty Project. October 2011.

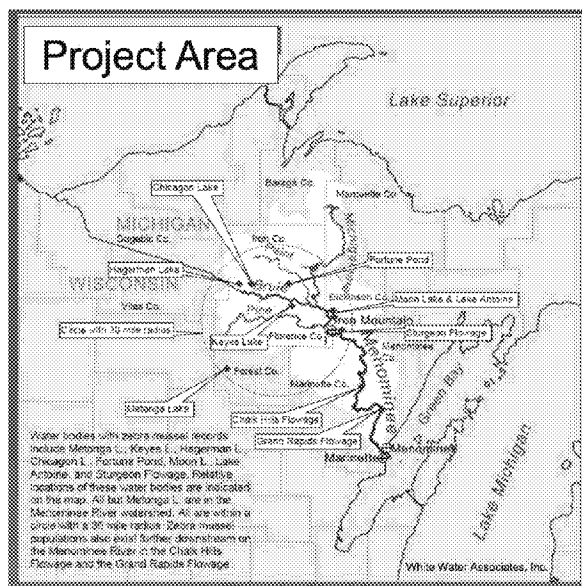
⁶² <http://dnr.wi.gov/topic/EndangeredResources/Animals.asp?mode=detail&SpecCode=IMBIV45020>

⁶³ *Truncilla donaciformis* (Fawnsfoot). Michigan Natural Features Inventory. 2007. Rare Species Explorer. Available online at <http://mnfi.anr.msu.edu/explorer> (Accessed Jan 28, 2018).

⁶⁴ Cummings, K. S. and C. A. Mayer. 1992. Field Guide to Freshwater Mussels of the Midwest. Manual 5. Illinois Natural History Survey, Champaign, IL.

“Over 800 live mussels, representing 12 species, were observed in **this 2014 study**, with 521 observed in the vicinity of the first potential outfall location and 296 near the second potential outfall location. No Federally listed species were observed at that time, but species designated as having special State Protected status included the State Endangered hickorynut (*Obovaria olivaria*), the State Endangered black sandshell (*Ligumia recta*) and the State Species of Special Concern round pigtoe (*Pleurobema sintoxia*). All of these mussels were found in stable gravel-sand substrate within 20 meters of the shoreline in water that was one to three meters deep in the vicinity of the two potential outfall locations.”

Explain what is meant by “no Federally listed species were observed at that time” – were Federally listed mussel species anticipated in this stretch of the Menominee River in 2014? Were they observed in previous surveys, or in subsequent surveys? Were these Federally listed species observed in the Menominee River during other surveys, or observed by other researchers?



Mussel Relocation Relocation Site Selection - Zebra Mussels

According to the “Proposed Study Plan for Freshwater Mussel Relocation Associated with Proposed Outfall” (September 2017 Stantec letter to Michigan DNR, page 272 Appendix B), “The field notes from our 2014 survey were silent regarding whether zebra mussels were present or not and no mention of them was made in the final report. We reviewed photographs of live specimens and spent valves and observed no evidence of zebra mussels or attached byssal threads. **We infer from our review of this information that they were not present at either outfall location.**”

Scientifically speaking, this is weak, and Stantec’s poor field notes and “inferred” conclusions about zebra mussels are absolutely inadequate. Further confusing the matter, Stantec submitted a “Back Forty Mine Project – Aquatic Impact Analysis” document dated September 25, 2017, stating “Zebra mussels (*Dreissena polymorpha*) were found at ALL locations sampled in the Menominee River.” In another section of the application, Stantec stated “A mussel survey conducted within reaches of the Menominee River **adjacent to the Project Area identified one invasive mussel species, the zebra mussel.**” (Vol. 8 page 220). Zebra mussels were discovered in the Menominee River Watershed in 2010, according to data by White Water Associates and the Wisconsin Department of Natural Resources; zebra mussels in “breeding populations” were identified both upstream and downstream of the Sixty Islands area of the Menominee River, as illustrated by the red dots in the slide labeled “Project Area” (White Water Associates). The Wisconsin DNR/ White Water Associates study was not cited in the permit.

In 2015, Shakey Lakes water samples tested positive for zebra mussels using eDNA testing. The Shakey Lakes Integrated Management Plan (Lake Township, Menominee County) concludes that *“monitoring should continue for this species. Consider installing zebra mussel monitoring plates underneath docks and check them periodically to see if mussels have attached to the plates.”* Are ZM monitoring plates or other methods of surveying for zebra mussels (plankton tows for veligers, shoreline surveys for shells, etc.) proposed by the applicant (for the relocation site)?

Research by the Wisconsin DNR and the University of Wisconsin’s Aquatic Invasive Species Smart Prevention Program shows a strong correlation between calcium and zebra mussels: Testing showed that “the calcium level of Shakey Lakes was assessed at 48 mg/L, which is well within the adequate range to support a zebra mussel population... **Zebra mussels need calcium levels of 10 mg/L to initiate shell growth and 25 mg/L to maintain shell growth** (Benson, et al., 2017).”⁶⁵ According to an article about recent upgrades to the Twin Falls Dam (We Energies) on the upper Menominee River (upstream from the mine site), “Zebra mussels are invasive and have been increasing in the river since the late 1980s.”⁶⁶

According to data presented in Volume VIII, Appendix A, dissolved calcium concentrations of Menominee River surface water were measured four times per year (winter, spring, summer and fall) at four locations along the river for several years, from fall 2007 through spring 2011 (Tables 6, 7, 9 and 10). Three of these sites (MSG-10, 13, and 14) were in the area of the the proposed mine site, while the fourth (MSG-14) was roughly 5 river miles downriver from the site, at a USGS gauging station (see Figure 3). MSG-10, 13, and 14 had calcium concentrations that were typically in the mid-20s (mg/l), with ranges of 21-31, 21-28, and 21-29 mg/l respectively. Calcium concentrations at MSG-11 were similar, with a range of 22-31 mg/l. While these calcium values are obviously high enough for zebra mussels to persist in the river, they are probably close enough to borderline to limit their abundance. These relatively low calcium levels are likely what keeps zebra mussels from carpeting the riverbed and virtually all other solid surfaces, including the shells of other mussels and clams.

The fact that ambient calcium levels in the Menominee River water are borderline for zebra mussels means that even relatively small additions of calcium could trigger significant increases in zebra mussel abundance. Unfortunately the NPDES permit for the proposed mine (Permit No. MI0059945) doesn’t include monitoring or discharge limits for calcium.

How much dissolved calcium will be added to the river with the proposed discharge water? Does the applicant predict an increase in zebra mussel abundance around the outflow and downstream, due to the increased calcium availability? If so, what are the likely impacts of increased zebra mussel abundance on native mussels, including relocated populations?

Describing the planned mussel relocation site, Stantec claims “The objective of this field effort is to identify a mussel relocation site in the Menominee River with habitat that is **equal to or better than the permitted outfall location. Site selection criteria will include:**”

- Same reach as the permitted outfall location (i.e. between two stream confluences) or
- Within the same watershed, but in a different reach or tributary;
- The presence of a similar mussel community;
- Evidence of good recruitment;
- Similar substrate and habitat types
- Appropriate fish host species must be present
- Secure from the risk of foreseeable future disturbances (e.g., dredging)
- Zebra mussels (*Dreissena polymorpha*) and Quagga mussels (*D. rostriformis*) are absent

Is additional exploratory drilling along the river’s shoreline considered a “foreseeable future disturbance” for the purposes of mussel relocation site selection? What is the risk of “expanded sulfide mining”?

⁶⁵ Lake Township, Menominee County, Michigan: Shakey Lakes Integrated Management Plan

<http://www.dickinsoncd.org/uploads/9/4/7/3/94739884/shakeylakesmanagementplancompressed.pdf>

⁶⁶ <https://medium.com/the-hydroelectric/innovative-upgrade-means-more-clean-power-at-twin-falls-11c6152260dd>

Exploratory drilling is poorly regulated in Michigan, and the applicant is actively targeting additional sites along the Menominee River south and west of the proposed pit. The orebody likely extends underneath the Menominee River, and possibly onto the Wisconsin side of the River. Is mining on two sides of the river a foreseeable future disturbance?

Stantec's 2017 "Summary of Existing Baseline Data" is a largely unreadable mishmash of information, snippets filled with contradictory statements that are more often confusing than clarifying. First, the summary appears largely (but not entirely) organized by reports, chronological, rather than subject (as the subtitles suggest) For example:

- "No endangered, threatened or special concern species were collected within the Menominee River sampling transects." This statement stands alone, as if suggesting there are no listed species found in the river, rather than acknowledging the presence of listed species.
- ERM study is listed as a Draft Aquatic Biota Report dated "2011" although all the data in it comes from 2007-2009.
- "Aquatic data was collected from surface waters **within and adjacent to the Project**" but at the same time **"No streams, lakes or ponds were identified or examined within the Project Area** as part of this study." Basically – only a few sites on the Menominee River? In the mine site, or maybe not? Again, the summary is more confusing than clear.
- Regarding sturgeon, the summary is confusing: "This 2010 review included an evaluation of previous field survey data collected by the Wisconsin Department of Natural Resources (WDNR) from 1973 to 2007, and a 2009 electrofishing survey completed by ERM for the Back Forty project (ERM, 2011). Her review found that in 2005 and 2006 WDNR had estimated the adult sturgeon population to range between as few as **169 individuals to as many as 2,223** individuals in the subject reach of the river during that time period. In the above-referenced 2009 ERM survey, **twelve sturgeon were collected.**" The previous paragraph said "Drift nets were deployed on two occasions between May 11th to 20th, 2009 to collect sturgeon larvae. **Sturgeon were not captured** in the nets, although other locally common species were present. In addition, juvenile **sturgeon were not observed** during the reconnaissance surveys." Again, Stantec's summary combines facts from different surveys creating maximum confusion! There are no sturgeon, there are 169, there are thousands of sturgeon, there were twelve, there were no juveniles. What clarity is expected to be gleaned from this summary?

*How does the applicant propose to locate a suitable relocation site, where zebra mussels are absent, when there is a breeding population of zebra mussels in the river, and Stantec confirmed that zebra mussels were found at "all locations sampled in the Menominee River"? The "absence" of Zebra mussels cannot be confirmed by consulting "silent" field notes or "inferred" conclusions. In addition to planned surveys, we recommend the use of eDNA testing to perform a broad- spectrum test for an array of invasive species that may impair mussel relocation plan, and the development of a Rapid-Response plan, coordinating with the larger "MENOMINEE RIVER WATERSHED ZEBRA MUSSEL RAPID RESPONSE STRATEGY."*⁶⁷

Mussel Relocation Protocol - Water Quality

Concerns remain about the applicant's proposed relocation of freshwater mussels. Reviewing the new (September 2017) Draft Michigan Freshwater Mussel Survey Protocols and Relocation Procedures by the US Fish & Wildlife Service⁶⁸ - for **"Site Selection"** there is no mention of **"water quality"** in terms of **site selection**. Potential relocation sites should evaluate sediments and river water for the presence of heavy metals. Site selection criteria in the draft protocol is limited to *location, presence of mussels and fish, substrate, physical disturbances, and invasives*. But all unionid species are vulnerable to pollutants

⁶⁷<https://www.uwsp.edu/cnr-ap/UWEXLakes/Documents/programs/convention/2012/DeanPremoAndMaureenFerry-IntegratedEducationPlanningAndResearchApproachToZMs.pdf>

⁶⁸ <https://www.fws.gov/midwest/eastlansing/te/pdf/MIFreshwaterMusselSurveyProtocolsRelocationProcedures.pdf>

and heavy metals, so reducing point and non-point water pollution such as pesticide/herbicide applications, agricultural and urban runoff, **industrial waste, and mine drainage** is a priority.^{69 70}

The Back Forty orebody contains copper and zinc, as well as lead, gold, nickel, arsenic, cadmium and other toxic metals. Long-term metal bioaccumulation studies should be planned, evaluating the health of Menominee River's freshwater mussels at a "baseline" level, with ongoing surveys of the same site during the life of the mine, and post-closure. Lead, zinc, mercury and aluminum should be of particular concern.

As bioaccumulating species, mussels are extremely sensitive to heavy metals. Recent research into freshwater mussels in a watershed impacted by historic mining ("Residual effects of lead and zinc mining on freshwater mussels in the Spring River Basin")⁷¹ demonstrates the devastating long-term effects of lead and zinc:

"Sites on the Spring River immediately upstream of heavily mined areas supported at least 21–25 species of mussels, whereas sites near the lower terminus of the river yielded evidence of 6–8 extant species. Between the upper and lower quantitative survey sites, mean mussel and clam densities declined by 89% and 97%, respectively. **Tributary reaches below heavily mined areas lacked evident bivalve communities** and contained concentrations of Cd, Pb, and Zn that continually or sporadically exceeded hardness-dependent water quality criteria and consensus-based sediment quality guidelines (probable effect concentrations).... **Overall, streams draining heavily mined areas exhibited depauperate (or fully extirpated) mussel assemblages and correspondingly elevated concentrations of Cd, Pb, and Zn in water, sediment, and bivalve tissue.** Other evaluated environmental chemistry parameters, and physical habitat conditions assessed at the stream reach scale, demonstrated little general relationship to the degraded status of these assemblages. We conclude that pollution attributable to former mining operations continues to adversely influence environmental quality and impede the recovery of mussel communities in a large portion of the Spring River Basin."

Concerns about the Freshwater Mussel Survey Relocation Protocol

- Comparing with the mussel relocation protocol used for Minnesota,⁷² explain whether "density survey grids" will be a required part of the Michigan mussel survey protocol?
- "Quantitative Surveys provide more detailed information about sites. Quantitative sampling will be conducted using 1 m² quadrats and a systematic sampling design with three random starts in 3 m by 5 m blocks oriented perpendicular to stream flow in accordance with the methodology as described by Strayer and Smith (2003). **Blocks will be arranged in a continuous manner to provide bank-to-bank coverage.** Quantitative samples to be collected shall be 3 quadrats per 3m by 5m block. Quadrat surfaces will be visually inspected for mussels prior to excavation to 15cm (6 inches) followed by post-excavation visual searches. Data shall be reported separately for each quadrat sampled in the ADI and applicable buffers. In locations with high-density mussel communities (>2.5/m²), quadrat size may be reduced to 0.25m² with excavation depth remaining 15cm (6in). Overall survey coverage must remain equivalent."⁷³
- *Does the application propose to use a "bank to bank coverage" survey in preparing for the proposed mussel relocation? It does not appear that "bank to bank coverage" was previously used in the Stantec survey; rather, transect lines radiated into the Menominee River from the Michigan side (only) and extended into the water a short distance. None of the transect lines crossed to the Wisconsin side of the river, or reached islands.*

⁶⁹ Bringolf, R.B., W.G. Cope, C.B. Eads, P.R. Lazaro, M.C. Barnhart, and D. Shea. 2007. Acute and chronic toxicity of technical-grade pesticides to glochidia and juveniles of freshwater mussels (Unionidae). *Environmental Toxicology and Chemistry* 26(10):2086-2093.

⁷⁰ Grabarkiewicz, J. and W. Davis. 2008. An introduction to freshwater mussels as biological indicators. EPA-260-R-08-015. U.S. Environmental Protection Agency, Office of Environmental Information, Washington, DC.

⁷¹ <http://www.sciencedirect.com/science/article/pii/S0048969707006304?via%3Dihub>

⁷² "Minnesota freshwater mussel survey and relocation protocol - FMCS"

<https://molluskconservation.org/Library/Protocol%20PDFs/2013%20Minnesota%20Freshwater%20Mussel%20Survey%20and%20Relocation%20Protocol.pdf>. Accessed 29 Jan. 2018.

⁷³ September 2018 Draft

<https://www.fws.gov/midwest/eastiansing/te/pdf/MIFreshwaterMusselSurveyProtocolsRelocationProcedures.pdf>

- According to the protocol (“excavation to 15cm (6 inches)”) mussel sampling will excavate to a depth of only 6 inches, but mussels can be found several feet down in sediments? Explain.
- Vol VIII includes Stantac’s “Proposed Study Plan for Freshwater Mussel Relocation Associated with Proposed Outfall, Menominee River, Menominee County, Michigan (MDEQ File Number 2B5-QHB6-CZE8)
- Has the Environmental Protection Agency and USFWS reviewed and approved the 2017 (draft) Freshwater Mussel Survey Relocation Protocol? Our organization was not notified of the draft protocol document until December 2017. Was there a public comment period?
- Will the proposed relocation require a federal permit from USFWS, since federally listed species are present in the river and can be reasonably anticipated?
- Does the relocation plan include any specific protocols for recording data or tracking the long-term health of listed species? For example, the Minnesota protocol requires that “Each relocated specimen of an endangered or threatened species will be measured for length, aged by counting annual growth arrest lines, and marked with a slash line, dot of colored and rubberized superglue, or glued tag.”
- If PIT tags are to be used, will the mortality rate of the relocated mussels be remotely monitored (and the results made public)? Relocations can result in up to 50% mortality for freshwater mussels, so this is a significant concern.
- **Does the relocation project (or the 2017 Draft Mussel Relocation Protocol) include any quality control assurances?** In the Minnesota protocol, for example, “for the purpose of quality control, between 24 and 48 hours in advance of beginning the relocation project, 20 randomly selected mussels of various sizes and species per acre of project impact zone will be collected from within the impact zone, marked by placing a dot of superglue or tag on the shell, and randomly and widely returned to the impact zone substrate from the water surface.” To verify that all mussels are relocated, similar quality controls are recommended.

Indirect and Cumulative Effects of “Contaminated Areas” on Wetlands

Aquila’s original Part 632 Mine Permit application stated “Contaminated areas around Waste Water Treatment Plant (WWTP) will total 65,088 square meters.” The source of the anticipated contamination was not explained. Dust? Contaminated water? Treatment chemicals? We previously commented on this concern, but our comment was not addressed in the DEQ’s response. Now, in the Wetland Permit application, the facility site design has adjusted the location of the Waste Water Treatment Plant, bringing it even closer to wetlands. In terms of the Wetland Permit specifically – what will be the environmental impacts of the WWTP’s 65,088 square meter “contaminated area”? Since the WWTP will be located near the Shakey Lakes ERA, near Wetland 2b, and close to the south boundary of the Impacted Area (property boundary), demonstrate how far the impacts will be experienced, and whether the “contaminated area” would extend off-site, or impact the large wetland complex south of the Project, which Wetland 2b feeds?

Underestimated Impacts to Adjacent Wetlands

The applicant has a history of poor understanding of the site’s hydrology, and has offered flawed studies of the site in support of the Wetland permit. Indirect impacts underestimate the role of on-site wetlands as “headwaters”, providing recharge to contiguous wetland located downgradient on adjacent lands. Some headwaters include stream features, which were overlooked in the applicant’s initial site reviews. The stream impacts could be largely avoided through off-site milling. Adjacent landowners were not contacted to verify wetland watershed boundaries or provide narrative information concerning the health of wetlands and streams located on their lands, and wetland complexes extending off-site from the mine area.

Direct and Indirect Impacts to Public Forest Lands

A majority of the impacted wetlands are located on land currently owned by the State of Michigan, managed by the Escanaba State Forest. Where are the DNR’s comments concerning wetland impacts from this project? Has the DNR reviewed the Wetland Permit Application and provided comment? Given

the State's obligation to preservation of wetlands, it is important to understand what concerns may exist within the DNR. The State of Michigan is apparently still contemplating a land transaction with Aquila Resources, although the DNR Lands office recently stated that the land swap is NOT currently under consideration. It is our conclusion that this land swap should be rejected, as it will irreparably damage or destroy an intact "cultural landscape" – the mine site is part of a complex of archaeological resources, still intact within the Escanaba State Forest / Menominee River corridor. By contrast, the land proposed for exchange (now the mitigation site) is not connected with the Sixty Islands narratives of the Menominee Indian Tribe of Wisconsin. The activities proposed for the land swap – open pit sulfide mining and on-site milling – would violate Michigan's Trust responsibilities, endanger the adjacent Shakey Lakes savanna ecosystem, degrade water quality in the Menominee River, disturb or destroy multiple species of State-listed freshwater mussels, and degrade critical habitat for federally listed lake sturgeon.

Postclosure Reclamation of Wetlands at Back Forty Site?

- *To what extent will the destroyed, impaired and water-starved wetlands and vernal wetlands at the Back Forty mine site be restored during the Mine's Remediation phase?*
- *What benchmarks, if any, are proposed to be used to evaluate the recovery of the "self-sustaining ecosystem"? Are wetland plants, for example, expected to recover in the remediation phase?*
- *Since unregulated vernal wetlands (ephemeral forested wetlands) will be destroyed at the site during the life of the mining and milling operation, and regulated wetlands (also forested) will be impaired and indirectly impacted, explain how each wetland is expected to function, as an ecosystem, apart from its forest habitat – during the mine life, but also post-closure. What are the net losses of function, in the short term and long term? Are these losses offset by mitigation?*
- ***During closure and remediation of the site, will the surrounding forest habitat, critical to the functioning of forested wetlands, be restored?***
- *On the mine site, post-closure, how long is the wetland recovery expected to take, in order to achieve a "self-sustaining ecosystem" ? According to §324.63209 (8) "Both the mining area and the affected area shall be reclaimed and **remediated to achieve a self-sustaining ecosystem** appropriate for the region that does not require perpetual care following closure and **with the goal that the affected area shall be returned to the ecological conditions that approximate pre-mining conditions** subject to changes caused by non-mining activities or other natural events." Explain what standards will be used at the mine site, in post-closure remediation, to ensure that former wetland sites have been "returned to the ecological condition that approximate pre-mining conditions." What level of function will they be expected to achieve?*
- *Will wetland function "milestones" (such as those used in Michigan's Wetland Mitigation Banking program) be used to evaluate and certify the "progress" of man-made wetlands at the Back Forty site, such as the somewhat dubious wetland proposed to be created on top of the backfilled pit, post-closure?*
- *It is essential that **water quality** be considered in the restoration of any on-site wetland areas. Michigan Wetland (Banking) Mitigation sites are not required to meet water quality standards, and are not sampled for metals, but it is reasonably foreseeable that this wetland will be contaminated. NO COVER or LINER was planned for the Back Forty mine pit. Once backfilled, and regraded, post-closure, the site may retain water and hydrological connectivity may be restored – but the groundwater connection will create (or exacerbate) problems related to pH and/or the transport of dissolved metals from the (underlying) flooded pit waters. **Long-term water quality monitoring for this site and its outfall (culvert and drainage to the Menominee River) is essential.***

Vernal Wetlands: Endangered, Threatened, and Species of Special Concern

According to the Mine Application Vol. 1, "Threatened and endangered species could be present within the Project Area based upon past surveys." *Clarify – which "past surveys" does this statement refer to? Were results of the past surveys (found in the Mining Permit's EIA) included in the application? Which*

"threatened and endangered species" specifically may be present within the Project Area, and why is there no comprehensive list provided in the application?

"In its July 29, 2016 letter to EPA the Corp identified several "un-regulated wetlands" within the impact area that may be hydrologically connected to the Menominee River. Groundwater and geochemistry reports submitted to MDEQ indicated that wetlands labelled as isolated may be hydrologically connected to the Menominee River, which would indicate that the wetlands are regulated. MDEQ must re-evaluate the regulatory status based on the recent groundwater and geochemistry reports produced as part of the mine application."⁷⁴

The following summary is given on maps labeled We previously submitted extensive written comments to the DEQ pertaining to Aquila's Environmental Impact Assessment (EIA), with regards to wetlands, **vernal wetlands**, forested wetland habitats found at the Back Forty mine site, and concerns about wetland-dependent species such as salamanders that are found in these wetlands.

"Vernal pools are a valuable and increasingly threatened ecosystem, often smaller than the bulldozer that threatens to destroy them," according to the EPA. Small vernal wetlands on the proposed site are not protected, nor do they appear included in the proposed compensatory mitigation plan. Vernal pools provide critical habitat for a number of other plants and animals, including rare and declining species. According to the State of Michigan, "Vernal pools provide a safe haven for a diversity of frogs and salamanders, allowing the young to have greater survival than in other habitats like regular ponds. **For some frogs and salamanders, individual vernal pools are irreplaceable because they return to breed in the very same pool from where they hatched.**" The Michigan DNR urges the public to work **"with your local community or region to protect vernal pools and the surrounding forests"**⁷⁵ and notes that "while not usually considered in official definitions of wetlands, vernal ponds are very important in the life cycles of many wildlife species. In particular, many species of amphibians (frogs and salamanders) depend on these temporary ponds for breeding sites. This allows the vulnerable aquatic larvae (e.g. tadpoles) to mature in a place free of fish predators."⁷⁶ Those who are interested in viewing wetlands are reminded that "wetland habitats are fragile and easily damaged by human activity." The applicant's proposed activities at the Back Forty site appear to violate ALL Michigan's goals related to vernal wetland protection.

Concerning the importance of vernal wetlands, we previously submitted written comments to the Michigan DEQ and Michigan DNR, stating:

Aquila's facility design fails to incorporate any of MNFI's recommendations for conservation and management of vernal pools, including the following: *"2) Avoid or minimize activities that disturb soils or tree canopies in and near vernal pools, particularly during critical time periods for most amphibians. This is important because equipment use and canopy alteration can impact water quality and quantity and shift vegetation, resulting in changes to microhabitat that can pose serious problems for many amphibians 3) Maintain a buffer of native forest vegetation around vernal pools to protect them from land use activities and alterations to water quality, with concentric forest harvest buffer zones are 30 m (100 ft) with very limited or no harvest and 120 m (400 ft) with limited harvest and protection practices for the forest floor and woody debris (Calhoun and deMaynadier 2008, Michigan DNR and Michigan DEQ 2009). Recommended buffers between roads and vernal pools are at least 100 m (330 ft) wide. Other buffer zones of up to 300 m (1,000 ft) in which land development can be held below certain densities have been recommended (Calhoun and deMaynadier 2008). 4) Maintain as much natural cover, wetland area, and drainage connection as possible between groups of vernal pools*

⁷⁴ 8-15-16 EPA Comments Letter to DEQ: "This letter constitutes a Federal objection to the issuance of a permit for this project."

⁷⁵ http://www.michigan.gov/dnr/0,4570,7-153-10370_12141-300728--,00.html

⁷⁶ http://www.michigan.gov/dnr/0,4570,7-153-10370_22664-61132--,00.html

and between vernal pools and other wetlands, so that animals may continue to disperse between scattered vernal pools and wetlands.”⁷⁷

We did not receive any response to this point. Which of the MNFI recommendations are to be followed by the applicant: buffers of native forest vegetation around vernal pools to protect them from land use activities and alterations to water quality at least 100 ft wide? buffers between roads and vernal pools at least 330 ft wide? buffer of 1,000 ft for minimal development?

According to the MNFI, the landscape of Michigan supports a wide variety of ecologically distinct wetland natural communities. At least 33 different types of wetlands occur in Michigan. **In addition, many upland natural communities regularly support small, isolated wetlands such as vernal pools ... critical habitat to a broad diversity of plants and animals, releasing clean water to lakes and streams, holding excessive floodwaters and preventing widespread flooding, facilitating groundwater recharge, and serving as a source for recreation, inspiration, and beauty.”**

None of our original concerns about vernal wetlands were meaningfully addressed by the DEQ during the Mining Permit review. Our full original wetland comments are provided here:

- **Written Comments to Michigan DEQ, “Aquila Resources Back Forty Mining Permit Application and EIA, Project ID: 14A021” 2-16-16**
<http://bit.ly/Back40Comments21616>
- **Final Written Comments to Michigan DEQ, “Aquila Resources Back Forty Mining Permit Application and EIA” Project ID: 14A021” 11-3-16**
<http://bit.ly/Back40Comments110316>

Wetlands "Impaired" But Not “Destroyed”?

How were losses to vernal wetland (habitat) accounted for in the cumulative impacts review? What changes in water quality (turbidity, chemical, salinity, temperature) or quantity (lowered stream flow, starving of wetlands during groundwater drawdown) will be experienced during the Life of Mine, and will the losses continue until closure, or indefinitely? *To what extent does the type of wetland removed and impaired (predominantly vernal wetlands) contradict the State of Michigan's statements concerning the importance of Vernal Wetland conservation?*

Impacted Wetlands Support Four-Toed Salamanders

The “terrestrial surveys document... state ETSC species within and adjacent to the project area” including a wetland-dependant amphibian, the **Four-Toed Salamander** (*Hemidactylium scutatum*).

⁷⁷ Ibid p.25



Four-Toed Salamander. Photo by Nick Scobel



Four-Toed Salamander Wetland Habitat. Photo by Nick Scobel

- **The Four-Toed Salamander is an especially vulnerable species in Michigan and other Great Lakes states, due to “due to its tendency to occur in small isolated colonies and its vulnerability to habitat destruction.”**
- The Four-toed Salamanders “require suitable breeding wetlands within or near mature forests. They prefer mature forests with dense canopy cover to preserve body moisture, lots of downed woody debris for cover and foraging opportunities, and vernal pools, ponds, bogs, shallow marshes, or other fishless bodies of water for breeding and nesting.”
- “Much of the natural history information on four-toed salamanders is more than 50 years old. Studies of four-toed salamander from southern Michigan in the 1920s and 1930s... are frequently cited for life history information.”⁷⁸
- According to Nick Scobel’s *Herping Michigan*, the Four-Toed Salamander is a “small, secretive species” found only in “scattered locations where suitable habitat occurs” and “quite habitat specific. They are usually associated with sphagnum moss, but may also be found in and around bogs, seepages, and some vernal pools. Females seek out sphagnum moss in the late spring and lay a clutch of eggs within the moss and stand guard until they hatch.”⁷⁹
- Vernal wetlands are used for the larval development of the Four-Toed Salamander. Wetlands must be located within “mature upland deciduous or mixed deciduous-coniferous forests interspersed with sphagnum seepages, vernal ponds, or other fish-free habitats that serve as nesting sites (Pfingsten and Downs 1989; Petranka 1998). Mature closed-canopy forests provide favorable conditions including a shaded moist forest floor with organic soils and woody debris. Mature forests also encourage the growth of moss around pond margins (Petranka 1998). Upland forests provide cover, foraging sites, and overwintering habitat for juveniles and adults. Egg deposition and larval development occur in wetland habitats devoid of fish, often with a sphagnum component.”⁸⁰

Habitat requirements are not limited to wetland nesting sites. “Courtship and mating of **four-toed salamanders** occur in **upland forest habitat** in autumn.... four-toed salamanders congregate with other amphibians near overwintering sites. Specimens are rarely found during winter months and presumably spend the winter in **subsurface retreats** (Petranka 1998). In the spring, females emerge from overwintering sites and **migrate to nest sites**.”⁸¹ According to the U. S. Fish & Wildlife Service (USFWS),

⁷⁸ “Hemidactylium scutatum: INTRODUCTORY - Forest Service.”

<https://www.fs.fed.us/database/feis/animals/amphibian/hesc/all.html>. Accessed 13 Jan. 2018.

⁷⁹ <http://herpingmichigan.blogspot.com/2012/02/michigans-gummy-lizards-part-one.html>

⁸⁰ Minnesota Department of Natural Resources. 2016. ETSC Species Guide, [Online]. Accessed::

<http://www.dnr.state.mn.us/rsg/profile.html?action=elementDetail&selectedElement=AAAAD08010> [2016, November 17].

⁸¹ Ibid.

“A review of four-toed salamander in Wisconsin notes four-toed salamander rarity and suggests that more information, including basic data on distribution, is needed.”⁸² USFWS notes that four-toed salamanders may live for 9 years – longer than the proposed life expectancy of the Back Forty open pit mine.

- *What will be the expected impacts to the Four-Toed Salamander and other wetland-dependent species?*

Impacts To Salamanders And Other Rare Species

Salamanders will be harmed or destroyed under this permit. “Salamanders are in a terrible crisis. Around half of all the world’s salamander species are listed as threatened by the International Union for Conservation of Nature... One of the biggest issues affecting salamanders is the loss of their natural habitat. Many areas that were once suitable for salamanders to live in have now been destroyed...” The four-toed salamander is known to inhabit wetlands on the Back Forty site, according to the wetland permit application. This uncommon salamander is listed as “special concern” across the river in Wisconsin. Salamanders are relatively long-lived amphibians, and require forested wetlands (with leaf litter, rotten wood) to complete their full life cycle. *Habitat requirements vary. Probably the most common species in the upper Great Lakes region is the red-backed salamander, which inhabits wet to mesic forests - the eggs are laid in moist logs, etc. and the young complete their aquatic stage inside the egg, emerging as tiny salamanders. Others need ephemeral pools to complete aquatic stage - wetlands good for tadpoles and immature aquatic salamanders are supposed to be noted as such on MiRAM forms.*

Wetlands at the mine site include a number of other rare species of conservation concern in Michigan. Rare plants include dwarf milkweed (state endangered), Vasey’s rush (state threatened) and 7 plants listed as Region 9 “special concern” species. One of these, the butternut tree (*Juglans cinerea*) is being devastated across its range by butternut canker, caused by an introduced fungus. No less than three “threatened” and 6 “special concern” bird species are known from the immediate area, along with wood turtles and the once-common leopard frog. And the Menominee is well-known for its (currently) healthy population of lake sturgeon, listed as “threatened” in Michigan and “special concern” in Wisconsin. Questions: Since the Back Forty site will be cleared of topsoil and trees, what are the reasonably foreseeable impacts to the salamanders and other rare plants and animals currently living in the impacted wetlands? Will salamanders be relocated, killed, or avoided? Will annual “biological monitoring” surveys check for the presence of salamanders during seasons when salamanders are using wetlands, or during seasons when salamanders ought to be found in the surrounding forested habitat?

Management guidelines for the Four-Toed Salamander include “recommendations include a **50-foot no-cut buffer zone around wetlands known to be used as nesting sites and the retention of some adjacent forest habitat to create corridors connecting wetlands.** This interface between wetland and upland habitat provides cover for transformed juveniles vulnerable to desiccation. **Forest roads and recreational trails should be minimized and not cross wetlands known to be used as nesting sites.** Run-off from logging roads and forest trails into wetlands, vernal pools, and streams should also be avoided.”⁸³ According to USFWS management guidelines, “protecting breeding habitat and surrounding mature forest... maintaining complexes of mature forests used by adults and the pools and wetlands used by larvae in a mosaic that allows for movement between adult and larval habitat as well as dispersal between nesting areas.”⁸⁴

The wetland-forest interface is absolutely critical for this species of concern. “Close proximity of larval and adult habitats is considered essential for four-toed salamanders... In Michigan, Blanchard observed that

⁸² Meyer, Rachelle. 2008. *Hemidactylium scutatum*. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: <http://www.fs.fed.us/database/feis/animals/amphibian/hesc/all.html> [2016, November 17].

⁸³ Minnesota Department of Natural Resources. 2016. ETSC Species Guide.

⁸⁴ Meyer, Rachelle. 2008. *Hemidactylium scutatum*.

four-toed salamander nests were not found in water bodies that would otherwise provide larval habitat when water was not adjacent to forested habitat, and adults were not found in suitable forest habitat when there were no ponds or pools that provided adequate embryonic and larval habitat within or adjacent to the stand.”⁸⁵ Will the Back Forty site incorporate no-cut forested buffers and the retention of adjacent forest habitats in order to create corridors between wetlands? Explain whether ecosystem and habitat requirements for this species of concern will continue to be met at the Back Forty site, or if proposed facility will effectively destroy the identified population of Four-Toed Salamander? This species’ distribution within Michigan is poorly understood, and “any sightings should be reported to the Michigan Herp Atlas project”⁸⁶ – yet the Michigan Herp Atlas does not include any reports for *Hemidactylium scutatum* in Menominee County.

- *Survey sites included in the applicant's EIA included State of Michigan lands. Explain – were newts and salamanders documented during the EIA survey reported to the State of Michigan's Herp Atlas project? If not, why not? There are no records for this site.*
- *In light of USFWS guidelines to protect the Four-Toed Salamander, will the applicant be required to leave sufficient habitat (moss, rotting wood, significant buffer of living trees) around all vernal wetlands within the project site?*
- *If the surrounding forest, as critical to the function of vernal wetland ecosystems as water, will be excavated, developed or otherwise lost, shouldn't forest-dependant wetlands located within the mine site be considered "directly impacted" (destroyed)?*

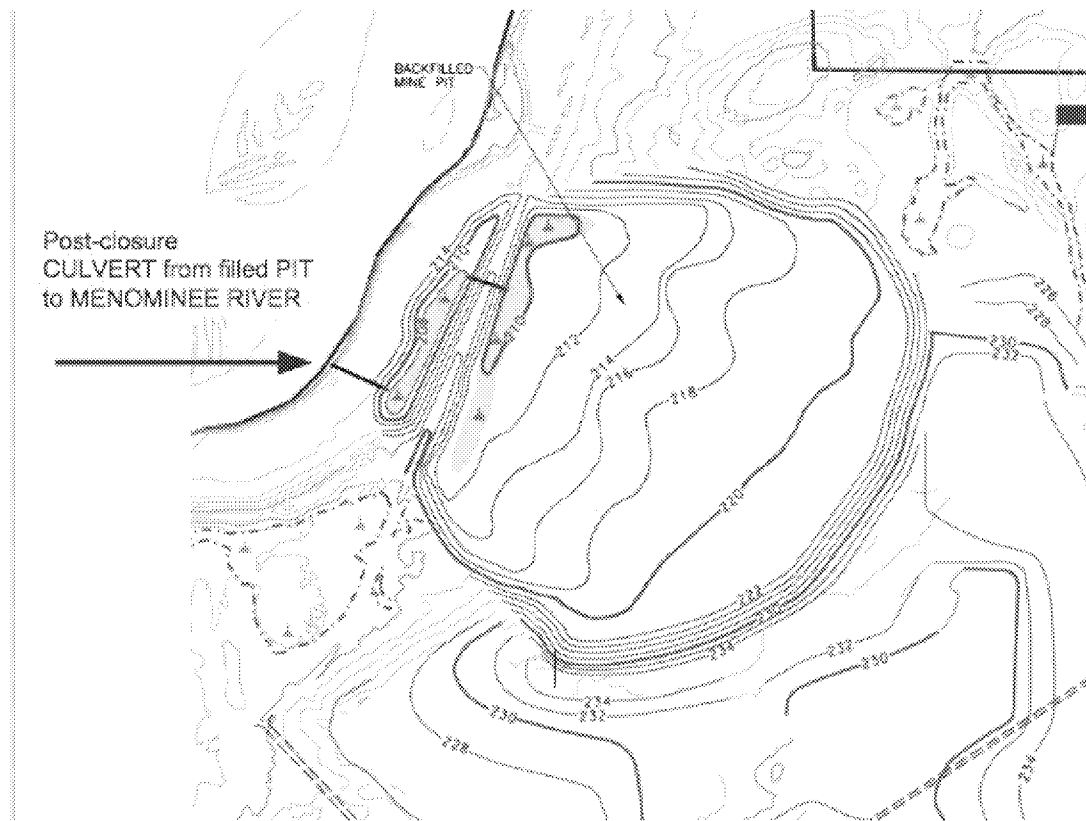
Artificial Wetlands

After backfilling, a man-made wetland was to be constructed over the backfilled pit mine (in the EIA). Has the plan for this site changed? What is the ultimate functionality of the "wetland" to be created over the footprint of the open pit, identified in post-closure drainage management plans? Will there be groundwater connection? What is the anticipated water quality (chemistry) in this artificial wetland?

Isn't long-term contaminated drainage from acidic waste rock in the backfilled mine pit "reasonable and foreseeable" hazard to the Menominee River? Contaminated drainage inputs? What species will be expected to successfully repopulate this wetland site, to create a "self-sustaining ecosystem" as required in closure? What level of ecological "function" will this artificial wetland be required to meet, and how will that function be monitored or measured? Additional clarity is requested concerning wetland and groundwater monitoring and compliance wells here. This plan seems foolhardy.

⁸⁵ Ibid.

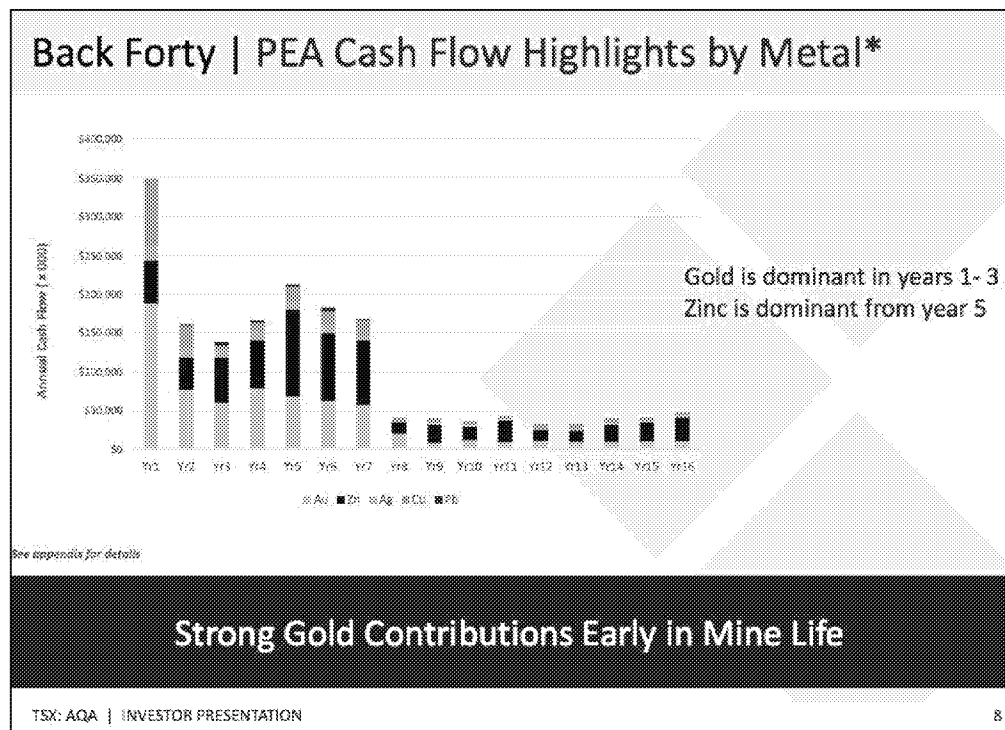
⁸⁶ <http://herpingmichigan.blogspot.com/p/mi-amphibians.html>



Wetland Monitoring Locations To Be Abandoned

The Wetland Permit shows that most of the current wetland monitoring points the site are to be abandoned, as shown in **Figure 1, Existing Monitoring Locations To Be Abandoned For Project Construction - Wetland Monitoring Plan**. Twenty locations are to be abandoned. No surviving monitoring locations are shown. How will this sensitive area be monitored for water quality in the shallow and deep aquifers, as well as surface water which would apparently collect in the man-made wetland before passing through a culvert to outfall naturally to the Menominee River? **Please clarify which, if any, wetland monitoring and compliance points will remain?**

The applicant has repeatedly, and we believe falsely, represented Back Forty mine project as a 7 year mine, but shows it as a 16 year project with estimate metal cash flows through Yr 16, and plans to submit an underground permit as soon as the facility is constructed:



Back Forty Development Strategy

- Complete permits and Feasibility Study for open-pit only
- Continue to evaluate underground mine plan and timing
- Continue to drill and better **define underground**
 - Ore body open at depth
- **Seek underground permit amendment post-construction**
- Continue exploration programs and drill satellite targets

Potential to **Extend Mine Life and Improve Project Economics**

TSX: AQA | INVESTOR PRESENTATION 11

In fact, the applicant is planning two distinct phases, “open pit” and “underground mining” phases: the 7 year open pit mine (Life of Mine or LOM) is only the *first phase* of the applicant's Back Forty mining project. In the Wetland Permit, the applicant does not acknowledge that they are planning a *second phase of mining*, described as a 9 year underground mining phase to immediately follow or begin concurrent with the open pit mining phase.

The Back Forty “underground mining” phase is described in dozens of the applicant’s press releases, the applicant’s own technical reports and feasibility studies, the applicant’s “social benefit” report, and in regular updates to investors. Aquila has repeatedly disclosed a detailed timeline – to investors, but not to regulators – outlining timeline for implement the “underground mining phase” at the Back Forty project.

According to CSP2, **“It is not possible to analyze the full environmental impacts of both phases, but it is reasonable to assert that cumulative effects of a 16 year mine life will result in greater wetland ecosystem losses, and losses of greater duration. There is no valid reason for segmenting the applicant's plans for surface and underground mining at the Back Forty site, other than to minimize the environmental impacts. Simultaneous permitting review for all phases of the planned mining operation is the only way to ensure that environmental impacts, including wetlands destruction and impairment, are fully understood, or that financial assurances have been properly set, or that the Postclosure estimates are accurate. Without full disclosure of mining phases, a complete environmental assessment is impossible.”** If the life of the mine is extended to 16 years, when will groundwater inputs to “impaired wetlands” return to normal?

It appears that the applicant has tried to minimize their environmental impacts by artificially limiting the “Back Forty project” to a 7 year open pit mine review, denying that underground mining will take place, thereby avoiding the greater impacts that would result from permitting a 16 year mine. Given the geophysical imagery and the applicant’s statements to investors, there is every reason to believe that if the Back Forty mine is constructed, it will be expanded.

While Michigan's Part 632 permitting system allows an “initial” project to be permitted, then amended and expanded, with new environmental impacts (hopefully?) assessed at the time of a future application for expansion, we fear the process of segmentation dangerously underestimates a project’s cumulative environmental impacts.

It is unclear why the State of Michigan has not demanded full disclosure of Aquila’s planned phases for the Back Forty mine. In practice, Canadian mining companies operating in other countries are familiar with the full disclosure of phased permitting (permits issued with knowledge of upcoming *phases* of mine activity or site development).

Wetland Destruction and Impairment May Be Significantly Underestimated

Regulated wetlands, vernal wetlands, and the headwaters of streams will be degraded, destroyed and impaired, and wetland-dependent ecosystems will permanently altered. The “Life of Mine” figure, fundamental to calculating wetland impairment and groundwater drawdown, should be viewed as incorrect. Based on the applicant's own statements, it is apparent that the actual “Life of Mine” figure should be 16 years at a minimum. The applicant’s failure to fully disclose their LOM plans in the Wetland Permit application has likely resulted in a significant underestimation of the amount and type of wetlands that will be impaired at the Back Forty.

- *In light of the applicant's clear plans for underground mining, expanding the life of the Back Forty mine, we request that an additional decade of groundwater drawdown, minimum, be used in evaluating the MODFLOW model, in order to show the reasonably foreseeable extent of groundwater drawdown from a 16 year mine.*

Groundwater drawdowns in particular would extend far beyond the “Area of Impact” and property boundaries. Greater wetland losses must be modeled, if groundwater drawdowns may continue for a 16

year life of mine. Note, if the applicant's planned 9 years of underground mining do not start immediately after the "7 year open pit" is completed, or if additional orebody lobes (already mapped) are targeted for underground mining, it is likely that the total life of mine could extend **beyond 16 years**.

Cumulative Impacts to Wetlands and Aquatic Resources from Metals

HgS – what are the potential reactions if (airborne) fugitive dust containing HgS enters the local wetland environment? Did the Wetland Permit analyze the extent to which airborne emissions (fugitive dust from mining/milling) will be deposited in wetlands on and surrounding the Back Forty mine site? In particular, with regards to accumulation of metals in low pH wetland or riparian areas, what is the potential for HgS or sulfide deposition to release mercury to soil and water? Methylmercury accumulates to toxic levels as it moves up through the food chain, eventually posing a direct threat to humans. *Does the proposed long-term wetland monitoring address mercury methylation (MeHg production) in freshwater wetlands at the Back Forty site?*

Cumulative Impacts from Mercury, MeHg

The NPDES permit contains no sulfate limits on discharges; increased sulfates in wetlands (e.g. from mine dust) should be expected to have a profound influence on mercury methylation. *Short-term and long-term monitoring of methylation is needed.* According to researcher Jill Coleman Wasik, "continued research is required to determine how sulfate-limited freshwater wetlands might respond to new, large inputs of high-sulfate runoff from mining operations" and chronically impacted wetlands do not appear to continually accumulate or produce MeHg at rates different from wetlands unimpacted by mining."⁸⁹ *In the remaining Back Forty wetlands, what are the anticipated rates of MeHg production or MeHg accumulation?*

"Mercury is a common environmental contaminant which becomes much more toxic in its methylated form because of methylmercury's ability to easily cross cell membranes, accumulate in biological tissues, then biomagnify through the food chain [1,2]. From the standpoint of human health risk, the accumulation of methylmercury in edible fish tissue has resulted in fishing restrictions, numerous health advisories, and much public apprehension [3-5]. In wetland environments that receive anthropogenic mercury contributions, the activity of sulfate reducing bacteria is especially important, and the effect of sulfate-reducing bacterial metabolism is two-fold:

- Methylmercury forms if sulfate reducers respire in the presence of a bioavailable species of inorganic mercury [6-10], as mercury methylation occurs through a side reaction within the bacteria's normal metabolic pathway [11-13].
- Sulfide is produced via bacterial respiration and the subsequent reduction of sulfate. In turn, the bioavailability of inorganic mercury to sulfate reducers is largely controlled by porewater sulfide concentration [14-16].

Historically, direct precipitation as solid HgS as well as adsorption to solid phases were thought to control dissolved mercury concentration. While the reaction of sulfide with Hg^{2+} to produce insoluble cinnabar (HgS) certainly decreases mercury availability for methylation [17], **there is believed to be a range of low sulfide concentrations which may actually enhance mercury bioavailability.** Several studies have noted that **the concentration of dissolved (bioavailable) inorganic mercury in sulfidic porewaters increases along with sulfide concentration to a certain degree [18,19]. Benoit et al. [14,15,18] hypothesized that, under low sulfidic conditions, the availability of mercury for methylation is increased by the formation of a neutral dissolved mercury-sulfide complex (HgS^0).**"⁹⁰

The applicant fails to acknowledge that increased MeHg production and increases in bioaccumulation of mercury would be a direct result of the Back Forty operation, exacerbated by the reduced assimilative capacity of (remaining) wetlands at the mine site.

⁸⁹ "Methylmercury production in a chronically sulfate-impacted sub-boreal wetland.

"<http://pubs.rsc.org/en/content/articlehtml/2016/em/c6em00138f>

⁹⁰ Harmon SM, King JK, Gladden JB, Newman LA. *Using sulfate-amended sediment slurry batch reactors to evaluate mercury methylation.* Arch Environ Contam Toxicol. 2007 Apr; 52(3):326-31. <http://sti.srs.gov/fulltext/ms2003337/ms2003337.html>

According to The ERM Fish Community Study, "Fish tissue analysis for contaminants was performed at two Menominee River locations, two Shakey lake locations and the uppermost station on the Shakey River. Hexachlorobenzene and PCBs were detected in approximately 50 percent of the samples and 4-4'ODDE and 2,3,7,8-TCDD were detected in each sample. **Mercury levels exceeded wildlife benchmarks in all sample locations.**" According to the EPA, methylation within the watershed can experience profound changes due to the interaction of sulfate (unregulated at this site), and mercury: "Watershed and waterbody conditions can undergo significant changes in capacity to transport, methylate, and bioaccumulate mercury. Examples of this include regions where sulfate and/or acid deposition rates are changing (in turn affecting methylmercury production independently of total mercury loading), and where the trophic status of a waterbody is changing. A number of other water quality parameters have been correlated with increased fish tissue concentrations (e.g. low pH...)"⁹¹

How will MeHg cumulative impacts further impair the Menominee River watershed? What are the human health concerns (mercury exposure), given the strong reliance upon fish in the diets of many residents, including treaty-protected rights to hunt fish and gather?

According to the EPA, "**Several studies have also examined the effects of chronic low-dose methylmercury exposures on adult neurological and sensory functions...** including loss of peripheral vision and chromatic and contrast sensitivity. These individuals also exhibited a loss of manual dexterity, hand-eye coordination, and grip strength; difficulty performing complex sequences of movement; and (at the higher doses) tremors, although expression of some effects was sex-specific. Although additional data would be needed to quantify a dose-response relationship for these effects, it is noteworthy that the effects occurred at doses lower than the Japanese and Iranian poisoning episodes, **via consumption of mercury-laden fish... the mercury exposure of the cohort is presumed to have resulted from fish-consumption patterns that are stable and thus relevant to estimating the risk associated with chronic, low-dose methylmercury exposure.**"⁹² *How much mercury will the Back Forty release per year, cumulatively? Has this cumulative total (loading) been used in "assessing the impact of other watershed and water quality changes (e.g., erosion, wetlands coverage, and acid deposition)" which may interact to increase mercury bioaccumulation? How will human health be monitored?*

Assimilative Capacity

How much is "too much"? The applicant assumes but fails to demonstrate that the impacts can be assimilated, but the *"term assimilative is a misnomer since there is no benefit for the receiving body of water from the addition of pollutants. (...)* Although the concept of waste assimilation is not new, its implementation for stream pollution abatement has been intermittent and its full potential neglected. Unfortunately it has been considered a **dilution phenomenon**. It is based upon two principles of reason: 1) a stream is not a sterile entity and 2) **waste receiving stream waters are (seen as) a natural extension of a biological treatment process.**"⁹³ The applicant is utilizing the Menominee River to cost-effectively dispose of their pollution. There are no benefits to the receiving waters, and freshwater mussels are being harmed. Has any environmental assessment considered the "capacity" of the Menominee watershed and wetland ecosystems to handle sulfide mining pollution?

Fundamental Groundwater and MODFLOW Modeling Concerns

Reviewing groundwater data in Volume VI, Appendix A1, and comparing Figure 5-3 and Figure 5-5, there is an unexplained change in the elevation of groundwater, suggesting modeling errors or manipulations of MODFLOW constraints. Table 5-3 and 5-4 claim "Hydrograph indicates soil saturation in the spring and seasonal water level fluctuations during operations that do not deviate from existing conditions." Under wetland WL-14, the loss is greater than 10 feet. The applicant has attempted to isolate the wetland from

⁹¹ "Regulatory Impact Analysis of the Final Clean Air Mercury ... - EPA NEPIS."
<http://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=91011BYT.TXT>. Accessed 30 Jan. 2018.

⁹² "Regulatory Impact Analysis of the Final Clean Air Mercury ... - EPA NEPIS."
<http://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=91011BYT.TXT>. Accessed 30 Jan. 2018.

⁹³ http://www.istor.org/stable/4313253?seq=1#page_scan_tab_contents

the underlying groundwater – in order to limit their Indirect Impacts? – but this claim is not demonstrated. See additional comments about “Upland Wetlands” and “Soil Borings.”

Comments on Process

Barriers to Meaningful Public Input

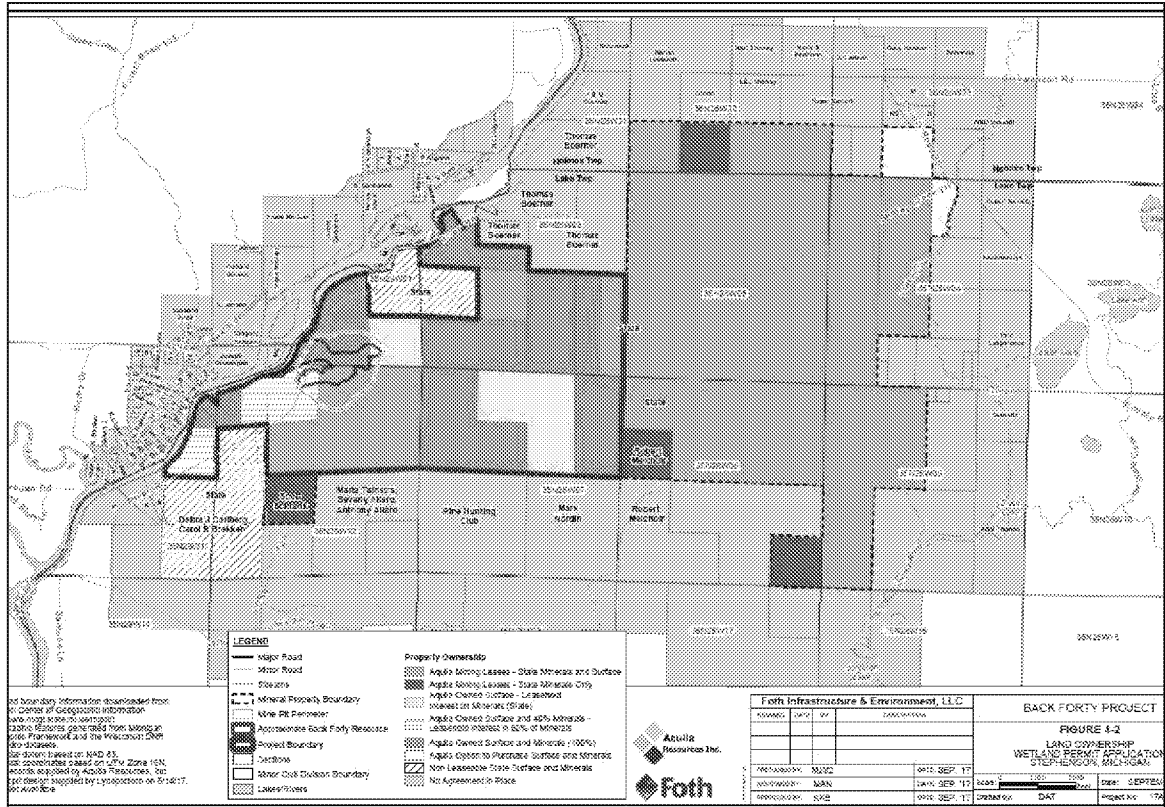
- **TECHNICAL NATURE OF PERMIT, LACK OF PERMISSION FROM ADJACENT OWNERS –** Adjacent landowners who are asked to provide technical comments on the potential impacts to water resources on their property (including wetlands and wells) report they have not given permission to the applicant for any wetland impacts which are anticipated to extend beyond the Project Boundary. Given the technical nature of the wetland permit review, many adjacent landowners, environmental stakeholders, and other concerned citizens continue to experience technical difficulty in using the MiWaters website, and express great frustration with the technical nature of the permit. The DEQ’s meeting with adjacent landowners was very helpful – but perhaps only a partial remedy for those seeking to understand a technical permit. *Why wasn’t a Public Meeting, with a Question and Answer session, held? Does the Michigan DEQ have any responsibility to educate the public? Hundreds – or perhaps thousands – of hours of DEQ staff time have been dedicated to the review of Aquila’s Wetland permit, in multiple iterations and drafts, between 2016 to 2018. How much time was spent educating the public about this Wetland permit, as compared with the time dedicated to assisting the applicant and their contractors?*
- **DEFINITION OF “ADJACENT”–** Since the mine’s western boundary is the Menominee River – the boundary line between Wisconsin and Michigan – and since the mine site’s “area of impact” diagrams clearly cross the Menominee River to include property owners on the Wisconsin side of the river, it appears there has been a serious barrier to public participation for “adjacent” landowners on the Wisconsin side of the river. This barrier to public participation would have been avoided if the Wetlands and NPDES permit applications, and their impacts to the Menominee River watershed, were considered under federal review, rather than Michigan’s delegated authority.

The following landowners, listed as “Adjacent Property Owners” in the Public Notice document, are indeed *adjacent to the mine project*:

Adjacent Property Owners:

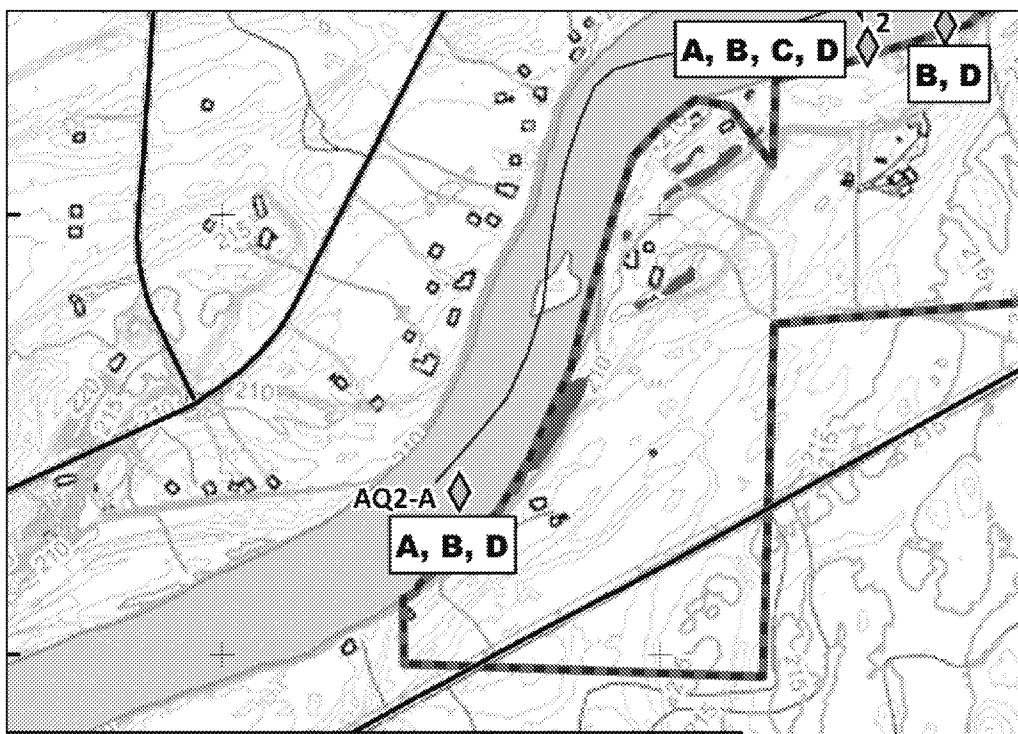
Mark Nordin
Pine Hunting Club c/o Kevin Dolskey
Anthony Allard
Marla Tuinstra
Thomas Boerner

State of Michigan, MDNR
Scott Shrank
Debra Carlberg & Carol Brekken
Beverley Allard
Robert Melchoir



Land ownership in and adjacent to the proposed Aquila mine site. Figure 4-2 from Volume I of the Aquila wetland permit application.

- As this map makes clear, the applicant is marking the center of the river (to indicate the State Boundary). The project area boundary is marked in Pink. Homeowners on the Wisconsin side of the Menominee River are considered Adjacent Owners to the Back Forty Project under riparian law. Their homes are also marked on this map.



- **Wisconsin landowners were NOT notified of the Public Notice.** They should have been considered “Adjacent Property Owners” for the purpose of the Public Notice, at the very least, since they are *riparian landowners adjacent to the mine project’s western border*. Under existing Michigan water law and riparian rights, the Menominee River itself is not “owned” by either state, but seen as a common navigable highway with water and bottomlands held to be Public Trust resources: “All navigable rivers within the territory occupied by the public lands, shall remain and be deemed **public highways**; and, in all cases where the opposite banks of any streams not navigable belong to different persons, the stream and the bed thereof shall become common to both.”⁹⁴

Landowners located on the Wisconsin side of the Menominee River are legally adjacent, and were identified by Aquila within “Lease Area” and “Affected Area” maps; they should have received Public Notice and other due considerations throughout this process. A partial list of the adjacent⁹⁵ landowners located directly opposite the Aquila Back Forty Project Boundary include the following (riparian) owners on Wisconsin side of Menominee River:

- Chris and Mary Heinz
- Joseph Greenspan
- Pat and Donna Hoffman
- Dave and Sue Vatland
- Don and Donna Stratton
- Paul Liegeois
- Leslie Karau
- Kevin and Tami Pieschek
- Carl Peterson
- Dave and Maryanne Tomasino
- Mike and Sue Czebotar
- Bruce and Janis Glaus
- Joe and Kate Lapierre

⁹⁴ “Chapter D Basic Law of Water Boundaries D1 - Bureau of Land” <https://www.blm.gov/cadastral/casebook/basicwater.pdf>. Accessed 13 Jan. 2018.

⁹⁵ List of adjacent landowners provided by Deborah Skubal, personal communication.

- Deb Skubal and Doug Lichtfeld
 - Robin and Beth Bender
 - Dick and Kathy Stein
 - Susan Hamilton
 - Dawn Schoenebeck
 - Nelson Greene
 - Bill and Sheryl(Cheryl?) Wood
 - Ken and Denise Victor
- Additionally, these owners have some part of their property within the “Affected Area” radius:
 - Bob and Susanne Tuttle
 - Mark Rowe and Diane LeBoeuf
 - Ken Lickel
- **ADDITIONAL STUDIES NEEDED** – In their 2016 application, Aquila stated that “additional field work will be needed.” Promises like this one – whether deferring a detailed understanding of hydrology or ecology – effectively provide no opportunity for public review. Fundamental data which is expanded, revised, or added in the future may cause this Wetland Permit to be viewed as technically inaccurate or administratively incomplete. The current application also mentions “additional” work the company intends to do after the permit is approved. In an August 2017 letter from Foth included in Volume VIII, a Foth representative states, “Additional boreholes will be required at the southernmost portion of the cut-off wall to provide the level of confidence required for final design and tender prior to construction.”
- **“AVOID DIRECT IMPACT TO WETLANDS” NEEDS REVISION** – The Back Forty Mining Permit contains wetlands-related language. For example, Special Permit Condition D.5 states “The permittee shall avoid direct impact to the following wetlands identified in the Environmental Impact Assessment during construction of surface facilities. WL40, WLA3. and WL2b” – Wetlands staff should inform DEQ whether this statement is still accurate, in light of revised wetlands delineation studies completed in 2017.
- **PUBLIC COMMENT BARRIER** – The Public Notice document states that comments must be specific and technical, may only comment on one permit (although the permit itself refers to other documents, and other permits, including the Part 632 EIA and the NPDES), and that state regulations or permit documents should be cited, to support any objections. While this is certainly best practice, we are concerned that the standard has been set excessively high for the public. Public comments – *on both sides of any issue* – are generally a combination of sentiment, personal experience, and factual objections. As Aldo Leopold wrote, “the evolution of a land ethic is an intellectual as well as an emotional process.” Most concerned citizens care deeply about wetlands, even those who are not familiar with hydrology and wetland delineation, and including those who have never read the Michigan administrative code. The Public Notice document should not send the message to concerned citizens that they are unqualified to participate in the public process of permit review. Public participation is a due process right. Personal experience, including indigenous knowledge of natural resources, comments related to a wetland’s cultural values, or the first-hand knowledge and insights of adjacent landowners, should be especially sought by regulators in this case.

Independent Analysis

Red-Flag Permit Review by Dr. Kendra Zamzow, with additional LEDPA Review by Dr. David Chambers, CSP2

A red flag review of the Wetland Permit has been conducted by Dr. Kendra Zamzow of the Center for Science in Public Participation (CSP2), which analyzes mining applications and provides objective research and technical advice to communities impacted by mining. Additional review of the Feasible and Prudent (Least Environmentally Damaging Practicable) Alternatives Analysis (§6) is provided by Dr. David M. Chambers, president of CSP2. Their review is linked below:

READ: [Red-Flag Wetland Permit Review by CSP2 \(PDF\)](#)

Dr. Zamzow is an environmental geochemist based in Alaska. She has a Ph.D. in Environmental Chemistry from the University of Nevada, Reno and a B.A. in Molecular and Cellular Biology from Humboldt State University, California. At UNR she operated a sulfate-reducing field bioreactor treating mine water discharge at an abandoned copper mine Superfund site, and provided laboratory water chemistry analysis for sulfate, metals, and alkalinity.

Dr. Chambers has 40 years of experience in mineral exploration and development – including 15 years of technical and management experience in the mineral exploration industry, and 25 years as an advisor on the environmental effects of mining projects both nationally and internationally. He is a registered professional geophysicist (California # GP 972) with a Masters Degree in Geophysics from the University of California at Berkeley, and Professional Engineering Degree in Physics from the Colorado School of Mines. He has provided assistance to public interest groups and tribal governments on proposed, operating, and abandoned mines located throughout the United States and Canada – reviewing environmental impact studies, analyzing the potential adverse effects on surface and groundwater quality of acid mine drainage and metals leaching from mine point discharges and seepage from mine waste storage facilities, and proposing alternative methodologies to avoid these impacts.

Hydrological Review by Dr. Tom Myers

A hydrological review of the Wetland Permit application has been completed by Dr. Tom Myers.

Scope: Myers' review focuses on the indirect impacts caused by operating the Back-Forty Mine on existing wetlands in the project area. The indirect impacts of interest are those related to dewatering drawdown, which could lower the water table beneath wetlands thereby causing those wetlands to drain faster when filled with surface water or disappear altogether if the wetland water surface connects to the water table. Dr. Myers' analysis involved an assessment of the predicted drawdown on wetlands and a review of the groundwater modeling of those impacts. One concern includes how the modeling conceptualized the wetlands, meaning the level of connectivity with surface water. Another concern includes the prediction of the extent of the drawdown, as modeled.

Conclusion: "The application acknowledges direct impacts to 11.22 acres and indirect impacts to 17.17 acres of wetlands. The review presented in this memorandum shows that indirect impacts will occur to far more than 17.17 acres because the modeling underestimates the extent of the groundwater drawdown. The Back Forty mine will have much greater indirect impact on wetlands than acknowledged in the permit application." - Tom Myers

READ: [Technical Memorandum: Hydrological Review by Dr. Tom Myers \(PDF\)](#)

Dr. Myers is a hydrologic consultant who works with conservation organizations and others on mining, natural gas, and water rights development, with specific interests in contaminants and mine dewatering. Myers has degrees in Hydrology and Hydrogeology and works with conservation organizations and others on mining, natural gas, and water rights development, with specific interests in contaminants and mine dewatering.

The Mining Action Group worked to secure these independent technical reviews in order to identify whether there are any errors or inconsistencies between groundwater data and Aquila's predicted impacts to wetlands, to review changes to the facility that may impact wetlands, to flag faulty conclusions or misrepresentations of fact, and ensure that concerned citizens, stakeholders and regulators are fully informed as to the true extent of all "wetland impacts" proposed by the applicant. Independent technical reviews of the Aquila Back Forty Wetland permit are made possible by the generous support of numerous groups and individuals concerned about the future health of the Menominee River. Working collaboratively, the Mining Action Group of the Upper Peninsula Environmental Coalition and the Front 40 secured small grants and donations from Freshwater Future, Superior Watershed Partnership, the Western Mining Action Network, DuPage Rivers Fly Tyers (DRiFT), Northern Illinois Fly Tyers (NIFT), Badger Fly Fishers, M&M Great Lakes Sport Fisherman, Wisconsin Smallmouth Alliance, Fly Fishers International, Great Lakes Council of Fly Fishers International, the Emerick Family Fund, and individual fishing enthusiasts throughout the Great Lakes area.

Conclusions

After thoroughly reviewing of the Back Forty Wetlands, Inland Lakes and Streams Joint Permit application, securing third party technical reviews, considering the proposed site, and consulting guidance documents of the Michigan DEQ and the EPA, we have concluded:

- As proposed, the Back Forty project is clearly NOT a wetland dependent activity. Under Rule 281.922a (7) *"If an activity is not primarily dependent upon being located in the wetland, it is presumed that a feasible and prudent alternative exists unless an applicant clearly demonstrates that a feasible and prudent alternative does not exist."*
- Applicant failed to show that there is "no feasible and prudent alternative" under §30311(4)(b). Under Rule 281.922a (8) *"Unless an applicant clearly demonstrates otherwise, it is presumed that a feasible and prudent alternative involving a non-wetland location will have less adverse impact on aquatic resources than an alternative involving a wetland location."*
- The burden of proof lies with the applicant. Aquila's LEDPA review of alternatives offered and dismissed several alternatives that were potentially feasible, failed to demonstrate due diligence in their review of alternatives, and offered inadequate environmental and economic analysis in support of their conclusions.
- In our comments, we identified several potentially feasible alternatives not considered in the LEDPA analysis, in order to illustrate flaws in applicant's review of "feasible and prudent alternatives", missing data, and basic errors including logical fallacies, such as *"mining company X owns an off-site mill and uses a spent pit mine for subaqueous tailings disposal; here, there is no nearby mill with a spent pit mine for subaqueous disposal; thus off-site milling is not feasible"*.
- Applicant failed to demonstrate that there will be no unacceptable impacts to wetlands and other aquatic resources. It is the responsibility of the permit applicant to avoid and minimize impacts.
- The Wetland Permit application was poorly prepared, and contains numerous underlying inaccuracies or assumptions. The applicant seems confused about the extent of their own proposal, regulations, and the criteria for review. For just one example of their confusion, see Aquila's Management Discussion and Analysis, September 2017, which states, *"The final required permit to operate and build the Back Forty mine is a Wetlands Protection Act permit covered under Northern Rockies Ecosystem Protection Act ("NREPA")."* (???)
- This application is not consistent with the Clean Water Act §404 requirements.

- Michigan's Administrative Code - Water Resources, Wetlands Protection⁹⁶ "Permit Review Criteria" sets out a clear test for reviewing the applicant's proposal: R 281.922a Permit application review criteria. Rule 2a. (1) The department shall review a permit application to undertake an activity listed in §30304 of the act according to the criteria in §30311 of the act. (2) As required by sub§30311(4) of the act, a permit applicant shall bear the burden of demonstrating that an unacceptable disruption to aquatic resources will not occur as a result of the proposed activity and **demonstrating either of the following: (a) The proposed activity is primarily dependent upon being located in the wetland. (b) There are no feasible and prudent alternatives to the proposed activity.**
- The applicant dismissed several feasible alternatives without providing a detailed explanation. LEDPA decisions were supported with a single spreadsheet, a handful of diagrams and a few paragraphs of text.
- The applicant failed to support their claim that the project's latest design is the "Least Environmentally Damaging Practicable Alternative" (LEDPA). **All other LEDPA alternatives were dismissed as "not prudent" or "not economically feasible" including the facility plan that is currently permitted** by their Mining Permit, issued under NREPA Part 632. The applicant's LEDPA review is deeply flawed, and provides insufficient economic feasibility information to support the LEDPA selection.
- Michigan's Review Criteria clearly states that "A feasible and prudent alternative may include any or all of the following: (i) Use of a location other than the proposed location. (ii) A different configuration" the LEDPA analysis was strictly limited in scope, location and concept. For example, the applicant failed to mention whether there are **any existing sites where off-site milling** could take place (eg: brownfield industrial areas) without constructing a new industrial site, and failed to calculate how far material could be transported in an "economically feasible" manner. Under R 281.922a (3) *"An applicant shall not so narrowly define the purpose as to limit a complete analysis of whether an activity is primarily dependent upon being located in the wetland and of feasible and prudent alternatives"*:
 - No additional properties were seriously considered, and none of the alternatives contemplated the feasible alternative of milling at a nearby location where most wetland impacts could be avoided.
 - The applicant identified "direct impacts to 11.22 acres and indirect impacts to 17.17 acres of wetlands." While some direct wetland impacts are related to the excavation of the orebody ("open pit"), we conclude that a majority of "indirect" impacts could be avoided.
 - Under their LEDPA analysis, the applicant failed to acknowledge nearby sites, including similar State Forest surface ownership, with substantially fewer wetlands. Under R 281.922a (3) *"A permit applicant shall provide adequate information, including documentation as required by the department, to support the demonstrations required by §30311 of the act."* The demonstration lacked basic documentation such as maps, photographs, sites considered, regional wetland maps, etc.
- **The "Back Forty project" described by the applicant is NOT the Least Environmentally Damaging Practicable Alternative.** The applicant failed to demonstrate that no other feasible options existed. Under LEDPA, the applicant must avoid environmental impacts instead of mitigating them: "if destruction of an area of water of the United States may be avoided, it should be avoided."
- In reviewing Michigan's administration of the wetland permit program, one problem that the EPA identified was "the need for EPA, MDEQ and the USFWS to develop a procedure to coordinate their activities when a potential project may have some effect on a federally threatened or endangered species or critical habitat."⁹⁷ In light of this shared concern, we note the following concerns about T/E species:

⁹⁶ "Wetlands Protection." http://dmbinternet.state.mi.us/DMB/ORRDocs/AdminCode/978_2011-015EQ_AdminCode.pdf. Accessed 5 Jan. 2018.

⁹⁷ https://www.honigman.com/media/site_files/71_imgimg376676.pdf (page 4 of 5)

- Under Part 303, wetland ecosystems must be assessed to determine their “benefits (values and functions).”⁹⁸ In the case of the Back Forty site, where the applicant underestimated impacts to **freshwater mussels, including state and federally listed species**, we expressed concerns about serious deficiencies in the applicant’s mussel surveys and mussel relocation proposal. In our review of the applicant’s NPDES permit, we noted:
 - Permit fails to analyze health risks and impacts on communities who rely on fishing for subsistence, including risks from toxic heavy metals, arsenic, methylmercury, use of cyanidation, and acid mine drainage.
 - Permit would harm endangered, threatened and special concern species, including sturgeon, mussels, river fingernail clams and snails.
 - Species-specific limits were not included in the NPDES permit. Multiple pollutants have no limit – “Report Only.” We asked that protective limits be set for ammonia, toxic metals with temperature-linked toxicity (copper, potassium, cobalt) and seasonal limits for pollutants toxic to aquatic life or bioaccumulation.
- In the case of the Back Forty site, we previously expressed our concern that the Aquila Back Forty EIA failed to include **Northern Long-Eared Bat (*Myotis septentrionalis*)**, listed as threatened under the Endangered Species Act in 2015. When the applicant failed to mention NLEB in the Part 632 mining application; we requested that the site be fully assessed to determine whether appropriate habitat is present, whether the bat is present at the site (roost trees, acoustic and mist net surveys), etc.
- **The applicant once again failed to mention the Northern Long-Eared Bat in this wetland permit application.** “Northern long-eared bats commonly forage within the forest and below the canopy mainly in upland forests on hillsides and ridges (Owen et al. 2003), but have also been noted to forage along paths, ponds and streams, and at forest edges. Foster and Kurta (1999) found all roost trees to be close to wetlands.”
- The Back Forty site is within the defined species range; and contains appropriate habitat (forested wetland sites). NLEB researcher Dr. Allen Kurta has suggested that the Menominee River corridor could be ideal NLEB habitat, given the presence of abandoned underground mines roughly 30 miles north of the site (hibernacula sites). “NLEB is a resident of the forest and overwinters in hibernacula, which are **abandoned mines...** a forest bat species (utilizing) a scattered forest openings and canopy gaps, as well as a **network of riparian corridors**.”⁹⁹ “Are the trees within a forested area and adjacent to a stream, lake, or wetland?” YES¹⁰⁰ Yet the applicant failed to acknowledge a potential for NLEB in the mine area, or identify any efforts to assess the site for this federally listed bat. Their compensatory mitigation proposal (forested riparian wetlands) also failed to mention NLEB.
- Given the presence of NLEB habitat (uplands, wetlands); in light of the applicant’s failure to acknowledge that their project is within the species’ range; and in the absence of any NLEB review, we ask the USFWS, reviewing this permit, to set strict restrictions on drilling-related construction and tree-clearing activities at the site from April through November, protective of NLEB, until the approved survey is completed.
- Lake Sturgeon is listed as a “rare” species in the United States. Over most of its range in the United States, it appears to be threatened. In Wisconsin, it is common in the Menominee River, but uncommon to rare in Lake Michigan.¹⁰¹
- The applicant’s proposed activity – mining and milling of sulfide ore on the bank of the Menominee River – is not protective for Sturgeon. The applicant proposes NPDES discharges

⁹⁸ Part 303 of 1994 PA 451, §30302(1)(b)

⁹⁹ https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd564445.pdf

¹⁰⁰ Criteria for Determining Northern Long-Eared and Indiana Bat Habitat, NLEB1/IB2 Non-Federal Decision Tree (last updated 8-14-2015)

https://www.michigan.gov/documents/mdot/LAP_PROCESS_TO_DETERMINE_NLEB_INDIANA_BAT_WITH_DECISION_TREE_FINAL_101515_503279_7.pdf

¹⁰¹ <https://dnr.wi.gov/topic/fishing/sturgeon/lakeSturgeonDistribution.html>

containing toxic metals, using a mixing zone to achieve compliance, with great potential for degradation of riparian wetlands (lowered water quality, seismic impacts on fish eggs, toxic metals from mine dust, etc.).

- Additional degradations, with impacts improperly calculated by the applicant, threaten wetlands at the mine site. Examples include: WL-68, adjacent to the Menominee River and currently providing excellent spawning habitat, and WL-14/14A/14B, a regulated complex directly threatened by the open pit. WL-14B will be excavated to create the open pit, while WL-14/14A, left in a no-man's land between the lip of the pit and the river, will be dewatered, contaminated by dust, contained behind the mine's proposed fence line berm, and shaken by blasting – yet somehow, in the applicant's summary, it will suffer only indirect losses from "proximity" and surface water. The applicant falsely claims that this complex is hydrologically perched. The impacts to this wetland, and others, are underestimated.
- The applicant failed to provide a finalized site plan. Their facility design scheme selected is not the LEDPA. The LEDPA analysis failed to offer any credible review of alternatives in order to avoid and minimize "direct, indirect, and cumulative aquatic resource impacts to the maximum practicable extent."¹⁰² Feasible alternatives exist, which the applicant did not consider.
- EPA's August 15, 2016 letter required, "A complete wetland mitigation plan that provides sufficient in-kind compensation for wetland and stream impacts, and meets the requirements of the 2008 Federal Mitigation Rule." The applicant's compensatory mitigation plan uses the "least desirable method of mitigation," and fails to meet the conditions under which the "preservation" method may be acceptable. While their mitigation ratio appears to meet the 20:1 requirement, further review of the applicant's data shows that impacts to wetlands at the site are substantially underestimated, which further invalidates the proposed mitigation.

We ask the State of Michigan to deny this permit application.

Thank for your consideration of our comments, questions and requests.

SIGNED,

Nathan Frischkorn, Mining Action Group of the Upper Peninsula Environmental Coalition
Steve Garske, Mining Action Group of the Upper Peninsula Environmental Coalition
Kathleen Heideman, Mining Action Group of the Upper Peninsula Environmental Coalition
Jon Saari, Mining Action Group of the Upper Peninsula Environmental Coalition
Horst Schmidt, President of the Upper Peninsula Environmental Coalition

¹⁰² 8-15-16 EPA Comments Letter to DEQ: "This letter constitutes a Federal objection to the issuance of a permit for this project."

Summary of Key Attachments

- **2018 Red-Flag Technical Review by Center for Science in Public Participation**
<http://bit.ly/Back40CSP2>
- **2018 Technical Memorandum: Hydrological Review by Dr. Tom Myers**
<http://bit.ly/Back40TMyers>
- **2017 MAG to DEQ: Significant Changes to Aquila Back Forty Mine Permit**
<http://savethewildup.org/wp-content/uploads/2017/12/Aquila-Back-Forty-Part-632-Amendment-Request.pdf>
- **2017 Michigan DEQ's response to MAG's request ("Significant Changes")**
<http://bit.ly/Back40-DEQOOGMreply>
- **2017 Michigan DNR response to MAG: Aquila Back Forty Land Swap Questions + Answers**
<https://drive.google.com/open?id=1ICicNm9EgbsNE8d8tbiVavEQL-fmIDQJ>
- **2016 Comments to Michigan DEQ, "Aquila Resources Back Forty NPDES Permit MI0059945"**
<http://bit.ly/Back40NPDES>
- **2016 Written Comments to Michigan DEQ, "Aquila Resources Back Forty Mining Permit Application and EIA, Project ID: 14A021" 2-16-16**
<http://bit.ly/Back40Comments21616>
- **2016 Final Written Comments to Michigan DEQ, "Aquila Resources Back Forty Mining Permit Application and EIA" Project ID: 14A021" 11-3-16**
<http://bit.ly/Back40Comments110316>